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OFFICE OF WATER RESEARCH AND TECHNOLOGY

SELECTED WATER RESOURCES ABSTRACTS

VOLUME 14, NUMBER 19
OCTOBER 1, 1981

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SELECTED WATER RESOURCES ABSTRACTS

A semimonthly publication of the Office of Water Research and Technology,
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The Secretary of the Interior has determined that the publication of the periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

PREFACE

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. These documents cover water resources as treated in the life, physical, and social sciences and the related engineering and legal aspects of the characteristics, supply condition, conservation, control, use, or management of water resources. Each abstract includes a full bibliographic citation and a set of descriptors which are listed in the **Water Resources Thesaurus.** The abstract entries are classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the then Federal Council for Science and Technology.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several services of the Office of Water Research and Technology. The cumlative SWRA file from 1968 and monthly updates are available also in magnetic tape through lease from NTIS.

THE OFFICE OF WATER RESEARCH AND TECHNOLOGY DOES NOT PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Comments and suggestions concerning the contents and arrangement of this bulletin are welcome.

Office of Water Research and Technology
U.S. Department of the Interior
Washington, D.C. 20240

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SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

LONGITUDINAL MIXING OF HEATED WATER IN OPEN-CHANNEL FLOW,
Iowa Univ., City. Inst. of Hydraulic Research.
J. Grimm-Strele, and W. W. Sayre.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-231862, Price codes: A08 in paper copy, A01 in microfiche. Report, June, 1980. 161 p 24 Fig, 3 Tab, 29 Ref, 2 Append. OWRT-C-3140(No 3692)(4).

Descriptors: *Research priorities, *Longitudinal mixing, *Hydraulic research, *Thermal diffusion, *Buouancy effects, *Dispersion coefficient, Velocity variations, Logarithimic velocity distribution, Neutrally-buoyant tracer, Experimental curves, Lagrangian properties, Densimetric Froude number, Two-dimensional flow, Three-dimensional flow, Instantaneous plane source, Buoyancy-related phenomena.

A laboratory flume was specially designed and constructed, and was used to study the longitudinal dispersion of heated water in an open channel. An instantaneous heated water source, uniformly distributed over the cross sections, was measured at various points downstream of the source. The side of the flume were smooth, but gravel was glued to the bottom to produce turbulence. Three-dimensional effects were found to be important. Velocity variations in the lateral direction increased the ambient flow dispersion coefficient almost three-fold over the theoretical value for a two-dimensional flow with a logarithmic velocity distribution. The most important buoyancy-related phenomenon was a significant increase of the initial convective period, and a delay of the onset of the final diffusive period, of the longitudinal dispersion process. With appropriate scaling factors, all experimental curves approximated the corresponding relation for a neutrally buoyant two-dimensional flow. Lagrangian turbulence properties permitted rapid estimates of the dispersion coefficient. Scaling factors and lagrangian quantities both depended on the initial Froude number. (Mullen-IPA)
W81-04307

CHANGES IN THE DISCHARGE CHARACTERISTICS OF THERMAL SPRINGS AND FUMAROLES IN THE LONG VALLEY CALDERA, CALIFORNIA, RESULTING FROM EARTHQUAKES ON MAY 25-27, 1980,
Geological Survey, Menlo Park, CA. Water Resources Div.
M. L. Sorey, and M. D. Clark.
Available from the OFSS, USGS, Box 25425, Denver Fed. Ctr., Denver, CO 80225, paper copy $3.25, microfiche $3.50. Geological Survey Open-File Report 81-203, (1980). 22 p, 3 Fig, 3 Tab, 10 Ref.

Descriptors: *Thermal springs, *Earthquakes, *Flow characteristics, Flow measurement, Turbidity, Hot springs, Hydrothermal studies, Monitoring, Observation wells, Physical properties, *California, *Long Valley caldera.

Changes in flow rate and turbidity have been observed and measured in hot springs in the Long Valley caldera, California, following earthquakes with magnitudes up to 6.3 in May 1980. Increases in flow rate of some hot springs occurred within minutes of the earthquakes, followed by more gradual decreases in flow rate to pre-earthquake levels. Spring temperatures and chemistries also show no long-term variations following earthquakes. Transient changes in discharge characteristics of the hot springs appear to result from increases in the permeability of fault conduits transmitting the hot water to the surface. (USGS)
W81-04350

PROCESS AND PLANT FOR THE RECOVERY OF WATER FROM HUMID AIR,
Mittex A.G., Vaduz (Liechtenstein). (Assignee).
P. Hussmann.
U.S. Patent No 4,219,341, 9 p, 3 Fig, 1 Tab, 8 Ref; Official Gazette of the United States Patent Office, Vol 997, No 4, p 1355, August 26, 1980.

Descriptors: *Patents, *Water sources, *Water types, *Water vapor, Adsorption, Condensation, Humidity, Solar radiation, Solar distillation, Equipment, Water recovery.

A process and plant for the recovery of water from humid air is described, in which at night cool humid air is passed through an adsorbent medium layer which adsorbs water from the air and in which, by day, air heated by solar energy up to a temperature which is above the ambient temperature is passed first through this layer to adsorb water from the layer and then is cooled down so that the water condenses. The daytime air, when entering the adsorbent layer, is heated by solar energy with a radiation which is preferably a black anodized aluminum web in which the adsorbent medium may be embedded and/or by the adsorbent medium layer which is colored black for better absorption of sun rays. By using reflectors, the solarization upon the adsorbent medium layer and/or the radiator may be intensified. (Sinha-OEIS)
W81-04522

THE MATHEMATIC-THERMODYNAMIC ANALYSIS OF THE ANOMALIES OF WATER AND THE TEMPERATURE RANGE OF LIFE,
Vienna Univ. (Austria). Inst. of Medical Physiology.
K. Trincher.
Water Research, Vol 15, No 4, p 433-448, April, 1981. 14 Fig, 6 Tab, 26 Ref.

Descriptors: *Water properties, *Thermodynamics, Colloids, Physical properties, Mathematical analysis, Thermal properties, Hydrothermal studies, Temperature, *Evolution, Mathematical studies, Animal physiology, Life cycles.

Between 0 and 15C, water is composed of a vacuum component, a quasi-crystalline component (K), a fluid portion (F), and ice-relicts (R). These four parts constitute the colloidal system. (K) produces the dispersing milieu in which (R) and (F) exist as two dispersed phases. The (R) component diminishes as the temperature rises from 0 to 15 degrees, while the (K)-portion increases in a proportional manner. (F) is the only dispersed phase present between 19 and 30 degrees; between 30 and 45 degrees, (F) and (K) are dispersed in the vacuum component. Between 45 and 60 degrees, (F) is the dispersing medium, with (K) as the dispersed phase. At temperatures over 60 degrees, water becomes structurally homogeneous (F). All anomalies of water may be described as a result of changes between the (R), (K) and (F) components. Warm-blooded animals have evolved with life forms that are restricted to a narrow range of temperatures, with an optimum at approximately 37.5 degrees. Water possesses its minimum heat capacity, a low coefficient of compressibility, and the maximum of structural possibilities at this temperature based on combinations of its (K) and (F) components. (Geiger-FRC)
W81-04557

2. WATER CYCLE

2A. General

DOCUMENTATION OF A DISSOLVED-SOLIDS MODEL OF THE TONGUE RIVER, SOUTHEASTERN MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
P. F. Woods.
Available from the OFSS, USGS, Box 25425, Denver Fed. Ctr., Denver, CO 80225, paper copy $5.75, microfiche $3.50. Geological Suvey Open-File Report 81-479, April 1981. 41 p, 2 Fig, 5 Tab, 11 Ref.

Descriptors: *Hydrologic models, *Simulation, *Streamflow, *Dissolved solids, Leaching, Salinity, Coal mining, Agriculture, Computer programs, *Montana, Southeastern Montana, *Tongue River.

A model has been developed for assessing potential increases in dissolved solids of the Tongue River as a result of leaching of overburden materials used to backfill pits in surface coal-mining operations. The model allows spatial and temporal simulation of streamflow and dissolved-solids loads and concentrations under user-defined scenarios of surface coal mining and agricultural development. The model routes an input quantity of streamflow and dissolved solids from the upstream end to the downstream end of a stream reach while algebraically accounting for gains and losses of streamflow and dissolved solids within the stream reach. Input data needed to operate the model include the following: simulation number, designation of hydrologic conditions for each simulated month, either user-defined or regression-defined concentrations of dissolved solids input by the Tongue River Reservoir, number of irrigated acres, number of mined acres, dissolved-solids concentration of mine leachates and quantity of other water losses. A listing of the Fortran computer program, definitions of all variables in the model, and an example output permit use of the model by interested persons. (USGS)
W81-04355

ON THE EXPECTED DIAMETER OF RANDOM CHANNEL NETWORKS,
Alberta Univ., Edmonton. Dept. of Mathematics.
J. W. Moon.
Water Resources Research, Vol 16, No 6, p 1119-1120, December, 1980. 11 Ref.

Descriptors: *Networks, *Channels, *Mathematical models, Monte Carlo method, River basins, Rivers, Watercourses, Topology, *River systems.

A mathematical proof is presented which supports the hypothesis that the mainstream length of river networks tends to be proportional to the area of the corresponding drainage basin raised to a power that decreases. It decreases from approximately 0.6 for small basins to approximately 0.5 for large basins. Calculations on the expected diameters of random channel networks were made by Shreve in 1974 for networks with up to 500 sources, and indicated that the logarithm of the expected diameter divided by the logarithm of the number of sources approaches 1/2 as the number of sources increases indefinitely. (Titus-FRC)
W81-04549

2B. Precipitation

SOME MEASUREMENTS OF THE PH AND CHEMISTRY OF PRECIPITATION AT DAVIS AND LAKE TAHOE, CALIFORNIA,
California Univ., Davis. Div. of Environmental Studies.
R. L. Leonard, C. R. Goldman, and G. E. Likens.
Water, Air, and Soil Pollution, Vol 15, No 2, p 153-167, 1981. 1 Fig, 6 Tab, 32 Ref.

Descriptors: *Precipitation, *Acid rain, Pollution, Air pollution, Rainfall, Davis, California, Sulfates, Nitrates, Industrial wastes, *Lake Tahoe.

Chemical analyses were performed on precipitation collected at Davis, California, and Lake Tahoe, during September 1972 and water years 1973 and 1978. The water year is defined as October 1 through September 30. Prevailing winds are westerly; local emission sources at Tahoe are mostly downwind, but pollutants accumulate during inversions. At both sites the precipitation was found to be more acidic than was water in equilibrium with atmospheric carbon dioxide. Acidity at Lake Tahoe increased over the 5-yr period, as reflected by a decrease in volume-weighted average pH from 5.10 to 4.67. Sulfate was the dominant acid anion in 1972-73. Industry in the San Francisco Bay Area was probably the major sulfate and nitrate precursors to the atmosphere. Total deposition of nitrate, chloride, sulfate and calcium ions estimated in a previous study on Nevada snowpack samples was at least an order of

magnitude less than the values obtained from fresh precipitation, indicating that the chemical composition of pack snow alters over time. (Baker-FRC)
W81-04538

RAINFALL VARIATION IN SWAZILAND,
J. R. Masson.
South African Journal of Science, Vol 76, No 5, p 234-235, May, 1980. 1 Fig, 2 Tab, 8 Ref.

Descriptors: *Drought, *Rainfall distribution, *Forecasting, Weather forecasting, Planning, *Swaziland, Africa.

A statistical model developed by Tyson and Dyer (1978) was applied to rainfall records at three stations in Swaziland to gain insight on oscillations between wet and dry periods. Since 1979 was the seventh year of a wet period, predictions are that in about 1982 there will be a shift toward drier conditions for a period of about ten years. The intensity of the dry period cannot be forecast; it could vary from a very mild drought as in 1963-72 to severe drought as in 1944-53 and 1926-34. No long term trend toward aridity is seen. Nevertheless, it is wise to plan for additional water storage and more efficient water use. Since human and animal populations have increased and urban centers are demanding improved water supplies, a drought in the 1980's would have more serious effects than previous dry periods.(Cassar-FRC)
W81-04617

CHEMISTRY OF MONSOON RAIN WATER AT DELHI,
Jawaharlal Nehru Univ., New Delhi (India). School of Environmental Sciences.
V. Subramanian, and K. K. Saxena.
Tellus, Vol 32, No 6, p 558-561, December, 1980. 1 Fig, 1 Tab, 11 Ref.

Descriptors: *Precipitation, *India, *Monsoons, Rainfall, Anions, Cations, Initial precipitation, Dissolved solids, Hydrogen ion concentration, Ions, Conductivity, Seasonal variations, *Delhi, India.

Samples of the 1978 monsoon precipitation collected from various locations in Delhi, India were analyzed for levels of sodium, potassium, calcium, magnesium, chlorine, HCO3, sulfate, phosphate, and SiO2. The pH values indicated that Delhi rain waters were slightly alkaline, while conductivity ranged from 25.2 to 290.0 reciprocal microohm-cm. The amount of total dissolved solids ranged from 35-170 ppm, depending on the sampling station and time of year. The total of major cations in all the samples was generally less than the total of anions. Three of the 14 sampling stations had major anion levels in rainwater that decreased with time, suggesting that the excess anions which accumulate in the atmosphere from local sources before the monsoon are washed out by the initial rainfall. (Geiger-FRC)
W81-04625

2E. Streamflow and Runoff

MODELING FOR ALTERNATIVE CRITRIA FOR DUAL PURPOSE DETENTION BASINS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
E. Whipple, Jr., W. H. Clement, and S. D. Faust.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-231813, Price codes: A02 in paper copy, A01 in microfiche. Interim Report, May, 1981, 15 p, 2 Fig, 2 Tab, 4 Ref. OWRT-B-084-NJ(1), 14-34-0001-1246.

Descriptors: *Flood control, *Detention rservoirs, *Storm runoff, Water pollution control, Retention, Floods, Water quality, Erosion, Stream erosion, Stream pollution, *Feed frequency, *Settleability of runoff, *Particulate pollutants, *Stormwater management, Dual purpose detention basins, Runoff pollution, Erosion tendency, Nonpoint sources.

Modeling was conducted of the passage of 2-year, 10-year and 100-year mean frequency floods through detention basins designed in accordance with various design criteria, including those with the single purpose of flood control as well as those with the additional purpose of removing particulate pollution. Additonal modeling tested results downstream on large drainage areas, totalling 8000 acres, with each of 400 sub-basins controlled by an identical detention basin, built in accordance with the design criterion being tested. Results show that the requirement to retain particulate pollution adds little to storage needed to prevent post-development increases in flooding from various sizes of design flood. Other insights are developed as to the effectiveness of various criteria for flood control and for alleviation of channel erosion tendencies. (Whipple - Rutgers)
W81-04302

FLOOD PLAIN MAPPING USING COMPUTER GRAPHICS,
GKY and Associates, Inc., Springfield, VA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-231870, Price codes: A05 in paper copy, A01 in microfiche. Final Report, Submitted to Office of Water Research and Technology, May, 1981. 78 p 11 Fig, 6 Ref, 3 Append. OWRT-C-90088-G(No 9630)(1), 14-34-0001-9630.

Descriptors: *Computer models, *Computer graphics, *Computer programs, *Technology transfer, *Water quality, *Flood forecasting, *Flood plain management, Flood limits, Flood easement delineations, Mathematical models, Federal flood insurance, Simulation models, FEMA, HEC-II computer program, Corps of Engineers, Computatioal algorithms, Federal Highway Bridge Routine, Hydraulic control, Supercritial flow Hydraulic profile, 100-year flood.

Based on a Feasibility Research Study completed at Cornell University, this study examine whether computer graphics could be used in specifying flood limits for Federal Flood insurance and local flood easement delineation. This was an extension of the Cornell research on water resources planning using computer graphics to generate analysis of a variety of water rsource problems. Complex mathematical models were adapted to computer graphics output; HEC-II Water Surface Profiles, a state-of-the-art computer program developed by the Corps of Engineers, was adapted for use in this program. The computer configuratin consisted of a PDP 11/45 mini-computer, a Sumagraphics digitizing tablet, and a Tektronix 4014-1 display terminal with a 4631 hard copier. The study was divided into nine tasks, including interfacing with the user community, adapting HEC-II to an interactive/graphical output environment, selecting the hardware system most responsive to user capabilities, coding, debugging, and testing the software, writing user manuals, and conducting demonstrations. The goal of demonstrating that computer graphics could be used in hydraulic analysis of flood plains was met. (Mullen-IPA)
W81-04308

A TECHNIQUE FOR ESTIMATING FLOOD HEIGHTS ON SMALL STREAMS IN THE CITY OF CHARLOTTE AND MECKLENBURG COUNTY, NORTH CAROLINA,
Geological Survey, Charlotte, NC. Water Resources Div.
W. H. Eddins, and N. M. Jackson, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-203473, Price codes: A04 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 80-106, December 1980. 16 p, 7 Fig, 3 Tab, 3 Ref.

Descriptors: *Floods, *Estimating, *Elevation, Streams, Flood recurrence interval, Regression analysis, Frequency analysis, *North Carolina, Mecklinburg County, Charlotte, Flood height, *Flood peak.

A method for estimating the height reached by floods having recurrence intervals of 10, 20, and 100 years is defined for unregulated streams in Charlotte and Mecklenburg County draining areas of less than 1.0 square mile. Flood heights, defined as the vertical distance between the streambed at riffles and the floodwater surface, can be used to estimate flood elevations on small streams where flood profiles and flood inundation maps are not available. An illustrative example is given of how the method can be used with streambed elevation data and topographic maps to estimate flood elevations and delineate inundated areas. (USGS)
W81-04325

CROSS SECTIONS OF THE HUDSON RIVER ESTUARY FROM TROY TO NEW YORK CITY, NEW YORK,
Geological Survey Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-04341

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA THROUGH SEPTEMBER 1980,
Geological Survey, Helena, MT. Water Resources Div.
R. J. Omang, C. Parrett, and J. A. Hull.
Available from the OFSS, USGS, Box 25425, Denver Fed. Ctr., Denver, CO 80225, paper copy $16.50, microfiche $4.50. Geological Survey Open-File Report 81-332, March, 1981. 114 p, 2 Fig.

Descriptors: *Flood peak, *Annual floods, *Small watersheds, *Floods, Flood frequency, Crest gages, Streamflow, Flow rates, Hydrologic data, *Montana, Missouri River basin, Columbia River basin.

Annual peak stage and discharge data have been collected and tabulated for crest-stage gaging sites in Montana. The crest-stage program was begun in July 1955 to investigate the magnitude and frequency of floods from small drainage areas. The program has expanded from 45 crest-stage gaging stations initially to 172 stations maintained in 1980. Data in the report are tabulated for the period of record. (USGS)
W81-04354

HEC-2 WATER SURFACE PROFILES, USERS MANUAL,
Hydrologic Engineering Center, Davis, CA.
Report, January, 1981. 258 p, 5 Fig, 4 Tab, 16 Ref, 8 Append.

Descriptors: *Computer programs, *Computers, *Water surface profiles, *Computer models, Friction loss, Encroachment, Flood plains, Flood forecasting, Bridges, Channel flow.

The program is intended for calculating water surface profiles for steady gradually varied flow in natural or man-made channels. This edition of the HEC-2 Users Manual provides input description for the November 1976 version of the computer program HEC-2 with modifications 50 through 54. It is an update of the August 1979 edition with revisions and provides instruction for program capabilities added by modification 54. The modifications are as follows: 50 - provides an option which enables the program user to specify which of the five procedures are to be used to estimate friction losses; 51 - enables a program user to use system control cards to bypass the normal HEC-2 output routines; 52 - changed trace number to correspond with the format statements used by HEC-2 trace options; 53 - added the archival tape output option and two new optimizing encroachment methods; 54 - provided improvements to the Flood Hazard Factor and channel improvement capabilities of the program, added new routines to enhance the readability of the program output, and reduced the size of the largest subroutine to facilitate easier compilation on smaller computer systems. The manual includes the theoretical basis for profile calculation; the basic data requirements; optional calculations; program input; and program output. The appendices include a sample application of HEC-2, floodway encroachment calculations, flood hazard zone determination, and application of HEC-2 bridge routines. (Brambley-SRC)
W81-04369

ON THE EXPECTED DIAMETER OF RANDOM CHANNEL NETWORKS,
Alberta Univ., Edmonton. Dept. of Mathematics.
For primary bibliographic entry see Field 2A.
W81-04549

2F. Groundwater

ANALYSIS OF THE DEVELOPMENT OF SHALLOW GROUNDWATER SUPPLIES BY PUMPING FROM PONDS,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 4B.
W81-04311

FIVE-YEAR HAWAII WATER RESEARCH AGENDA, 1982-1987,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 4B.
W81-04313

GROUNDWATER LEVELS IN NEBRASKA 1979,
Geological Survey, Lincoln, NE. Water Resources Div.
M. S. Johnson, and D. T. Pederson.
Conservarion and Survey Division, University of Nebraska, Lincoln, Nebraska Water Survey Paper Number 50, July, 1980. 65 p.

Descriptors: *Groundwater, *Wells, *Water level, *Water level fluctuations, Observation wells, Hydrographs, Well data, Aquifer characteristics, Hydrologic data, Nebraska.

This report summarizes the 1979 water-level changes in Nebraska on a statewide basis and by major areas where significant changes from estimated predevelopment levels have occurred. It describes the availability of data on water levels, provides information on changes in the water-level measurement program during the year, and summarizes data on the two major causes of water-level changes--precipitation and groundwater use. Because of the large amount of available data, much of the information presented in this report is of a generalized nature. The maps showing areas where water levels have risen or declined are an interpretation of point-value data, and some areas may not be precisely delineated. Changes in water levels are illustrated by hydrographs of 80 continuous-record wells for the period of record. (USGS)
W81-04323

WATER RESOURCES IN THE SEDONA AREA, YAVAPAI AND CONCONINO COUNTIES, ARIZONA,
Geological Survey, Phoenix, AR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-04328

SURFICIAL GEOLOGY OF HANNIBAL QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-04329

GROUND-WATER RESOURCES OF THE GRAMERCY AREA, LOUISIANA,
Geological Survey, Baton Rouge, LA. Water Resources Div.
D. C. Dial, and C. Kilburn.
Louisiana Department of Transportation and Development, Office of Public Works Water Resources Technical Report No 24, 1980. 39 p, 10 Fig, 10 Plates, 4 Tab, 19 Ref.

Descriptors: *Groundwater, *Aquifers, *Water quality, *Geohydrology, Aquifer characteristics, Wells, Water level fluctuations, Water yield, Water use, Surface-groundwater relations, Chemical analysis, Water resources development, Water management, *Louisiana, Gramercy area, Mississippi River.

The shallow, Gramercy, Norco, and Gonzales-New Orleans aquifers contain freshwater in parts of the Gramercy area. Shallow aquifers include point bars, Mississippi River alluvial aquifer, and local sands above the Gramercy aquifer. Water in the shallow aquifers is generally high in hardness and iron concentration and is little used. The major aquifers contain freshwater of good quality in some areas, but availability is limited. The Gramercy aquifer contains water of excellent quality in a small area near Belmont. Elsewhere the freshwater in the Gramercy aquifer is hard and high in iron concentration. The Norco aquifer contains freshwater of good quality in a narrow area that extends southward from Sorrento to Welcome. The Gonzales-New Orleans aquifer contains freshwater of excellent quality in the Sorrento area and southwest of Lake Maurepas, but the lower part of the aquifer contains salty water. Water levels in all aquifers except the Gonzales-New Orleans aquifer are responsive to the changing stages of the Mississippi River, reflecting the hydraulic connection between aquifers and the river. Water levels in the Gonzales-New Orleans aquifer are essentially unaffected by the river. (USGS)
W81-04330

SURFICAL GEOLOGY OF PART OF CAMDEN WEST QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-04331

SURFICIAL GEOLOGY OF PANTHER LAKE QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-04334

RESULTS OF TEST DRILLING FOR GROUNDWATER IN THE SOUTHEASTERN UINTA BASIN, UTAH AND COLORADO,
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-04335

SURFICIAL GEOLOGY OF PART OF WESTDALE QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-04337

GROUNDWATER CONDITIONS IN TOOELE VALLEY, UTAH, 1976-78,
Geological Survey, Salt Lake City, UT. Water Resources Div.
A. C. Razem, and J. I. Steiger.
Utah Department of Natural Resources, Salt Lake City. Technical Publication No 69, 1981. 95 p, 16 Fig, 1 Plate, 7 Tab, 36 Ref.

Descriptors: *Groundwater, *Aquifer characteristics, *Water level fluctuations, Groundwater recharge, Groundwater movement, Precipitation, Evapotranspiration, Wells, Hydrologic budget, Computer models, Water resources development, Hydrologic data, Water quality, Chemical analysis, *Utah, *Tooele Valley.

Ground-water conditions in Tooele Valley, Utah, did not change significantly between 1963 and 1978. Water levels in the artesian aquifers declined 2-4 feet in the Grantsville area, rose 4-12 feet in the Erda area, and remained relatively stable in the north part of the valley. The rise of water levels in the Erda area may be related to above-average recharge and the discharge of mine drainage. The average annual recharge to the artesian aquifers in 1977 was estimated to be 71,000 acre-feet, of which 23,000 acre-feet was by evapotranspiration, 28,000 acre-feet was from wells, 17,000 acre-feet was from springs, and about 3,000 acre-feet discharged to Great Salt Lake. The difference between recharge and discharge represents inherent errors in estimates, particularly for recharge from precipitation and discharge by evapotranspiration and from springs. No large areas of significant change in water quality were observed between 1963 and 1978. In two newly developed areas northwest of the mouth of Pine Canyon and north of the city of Tooele, however, wells yielded water with relatively high sulfate and chloride concentrations, respectively. A digital-computer model of the artesian aquifers was used to predict water-level changes for the period 1978-2008. The model indicated that water levels would decline less than 5 feet in most of the valley if well discharge were equal to the 1973-77 average discharge, and water levels would decline less than 15 feet in most of the valley if well discharge were 1.5 times the 1973-77 average discharge. (USGS)
W81-04338

GEOHYDROLOGY AND MODEL ANALYSIS FOR WATER-SUPPLY MANAGEMENT IN A SMALL AREA OF WEST-CENTRAL KANSAS,
Geological Survey, Lawrence, KS. Water Resources Div.
For primary bibliographic entry see Field 4B.
W81-04339

SURFICIAL GEOLOGY OF WILLIAMSTOWN QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-04340

POTENTIOMETRIC MAP OF THE WINONA-TALLAHATTA AQUIFER IN NORTHWESTERN MISSISSIPPI, FALL 1979,
Geological Survey, Jackson, MS. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-04342

POTENTIOMETRIC MAP OF THE LOWER WILCOX AQUIFER IN MISSISSIPPI, FALL 1979,
Geological Survey, Jackson, MS. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-04344

POTENTIOMETRIC MAP OF THE MERIDIAN-UPPER WILCOX AQUIFER IN MISSISSIPPI, FALL 1979,
Geological Survey, Jackson, MS. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-04346

BASE OF FRESH GROUNDWATER, NORTHERN LOUISIANA SALT-DOME BASIN AND VICINITY, NORTHERN LOUISIANA AND SOUTHERN ARKANSAS,
Geological Survey, Baton Rouge, LA. Water Resources Div.
G. N. Ryals.
Available from the OFSS, USGS, Box 25425, Denver Fed. Ctr., Denver, CO 80225, paper copy $4.75, microfiche $4.00. Geological Survey Open-File Report 80-2038, November,1980. 5 p, 1 Fig, 1 Plate, 1 Tab, 10 Ref.

Descriptors: *Groundwater, *Aquifers, *Louisiana, *Arkansas, Aquifer characteristics, *Radioactive waste disposal, Underground storage, Maps, Sites, *Northern Louisiana salt-dome basin, Salt domes.

The National Waste Terminal Storage Program is an effort by the U.S. Department of Energy to

locate and develop sites for disposal or storage of commercially produced radioactive wastes. As part of this program, salt domes in the northern Louisiana salt-dome basin are being studied to determine their suitability as repositories. Part of the U.S. Geological Survey's participation in the program has been to describe the regional geohydrology of the northern Louisiana salt-dome basin. A map based on a compilation of published data and the interpretation of electrical logs shows the altitude of the base of freshwater in aquifers in the northern Louisiana salt-dome basin. (USGS)
W81-04348

RECONNAISSANCE OF POTENTIAL FOR POTABLE GROUNDWATER SUPPLY AT KIPAHULU DISTRICT HALEAKALA NATIONAL PARK, MAUI, HAWAII,
Geological Survey, Honolulu, HI. Water Resources Div.
R. L. Soroos.
Geological Survey Open-File Report 79-749, May, 1979. 9 p, 1 Fig, 1 Tab, 2 Ref.

Descriptors: *Groundwater potential, *Potable water, Water resources development, Water quality, Groundwater availability, Aquifer characteristics, Natural recharge, Groundwater runoff, Wells, Water level, Pumping, Drawdown, Saline water intrusion, Chemical analysis, *Hawaii, *Maui, *Kipahulu Valley.

Kipahulu Valley drains an area of 12.7 square miles on the southeast side of the island of Maui, Hawaii. The aquifer underlying the lower reaches of the valley comprises recent lava flows. Fresh groundwater occurs in the aquifer as a thin basal lens, which discharges as diffuse seeps along the shore. Measured basal-water heads were 1.3 and 2.4 feet at respective distances of 600 and 3,500 feet from the shore. Chemical analyses of groundwater samples indicate that the water is potable. Wells to develop the basal water should be located at least 1,000 feet from shore. Well penetration should be limited to the upper half of the basal lens, and drawdown caused by pumping should not be greater than half of the head above sea level in order to avoid the risk of contamination by underlying saline water. (USGS)
W81-04351

GROUNDWATER RESOURCES INVESTIGATION IN THE AMRAN VALLEY, YEMEN ARAB REPUBLIC,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 6B.
W81-04352

ESTIMATE OF RECHARGE TO THE FRESHWATER LENS OF NORTHERN GUAM,
Guam Univ., Agana. Water Resource Research Center.
J. F. Ayers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-233595, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No 21, March, 1981. 26 p, 6 Fig, 3 Tab, 26 Ref. OWRT-A-017-GUAM(1), 14-34-0001-0112.

Descriptors: *Freshwater lens, *Groundwater recharge, *Chloride-ion concentration, *Rainfall, *Guam, *Annual recharge rate, Groundwater hydrology, Potable water, Runoff, Surface drainage, Volcanic terrain, Rainfall-runoff relationships, Evapotranspiration, Adelup-Pago fault, Eocene rocks, Alution formation, Percolation, Permeable aquifer, Coastal aquifer, Saltwater/freshwater front, Transition zone.

The groundwater hydrology of Guam has been studied by a number of investigators over several decades. One of the earliest studies was made by Peterman et al. in 1945 as part of a groundwater study sponsored by the military; this study estimated that the northern half of Guam received groundwater aquifer recharge at the rate of 0.39 mgpd per square kilometer. In 1964, Davis estimated a range of 0.73 to 0.89 mgpd reaching the freshwater lens of Northern Guam. In 1968, Davis and Huscel estimated the recharge rate at 0.97 mgpd per square kilometer in an administrative report prepared for the Air Force. Also, in 1968, Sheaham estimated that 50% of rainfall infiltrates the soil as recharge. In a report to the Public Utility Agency of Guam in 1970, Auston, Smith, and Associates, Inc. estimated a recharge rate of 1.04 mgpd per square kilometer. The present study was based on the chloride-ion concentration in rainwater. The chloride ion was used as a tracer which is concentrated evapotranspiration. The chloride-ion concentration of rainwater in Guam is 4.5 mg/liter, while the freshest part of the lens is about 11.8 mg/liter. Using the chloride-ion concentration as a tracer yields a recharge rate of 38% of rainfall, or about 83 cm/yr. (Mullen-IPA)
W81-04366

SIMULATION OF SALT-WATER INTERFACE MOTION,
GeoTrans, Inc., Reston, VA.
J. W. Mercer, S. P. Larson, and C. R. Faust.
Ground Water, Vol 18, No 4, p 374-385, July/August, 1980. 14 Fig, 3 Tab, 12 Ref.

Descriptors: *Model studies, Coasts, Aquifers, *Saline water-fresh water interfaces, Numerical analysis, *Groundwater movement, Mathematical models, Dupuit-Forchheimer Theory, Boundaries(Surfaces), Interfaces, *Coastal aquifers.

A numerical model is presented that solves the partial differential equations describing the motion of salt water and fresh water separated by a sharp interface, for example, in a coastal aquifer. Using the Dupuit assumption and performing a vertical integration results in quasi-three-dimensional areal equations that may produce fresh water head, salt water head, and interface elevation. The most efficient and accurate matrix solution from several finite-difference techniques applied uses the block line-successive over-relaxation. The model was tested in field studies near Kahului, Maui, Hawaii, and results compared well with a previous analytical solution. The Dupuit approximation was accurate for this case, but may be invalid for steep interface slopes. (Cassar-FRC)
W81-04584

CLASSIFICATION OF GROUND-WATER STUDIES--A CRITICAL NEED FOR RESEARCH AND DEVELOPMENT IN THE EIGHTIES,
North Carolina Dept. of Natural Resources and Community Development, Raleigh. Div. of Environmental Management.
H. M. Peek.
Ground Water, Vol 18, No 4, p 326-330, July-August, 1980. 1 Fig, 1 Tab, 2 Ref.

Descriptors: *Planning, *Investigations, *Groundwater, Geologic investigations, Research and development, Classification, Aquifers, Hydrology, *Water quality, *Groundwater research.

Defining the level of a groundwater study is difficult without secific descriptions. In the past, words such as reconnaissance, detailed, comprehensive, and intensive have been used to differentiate between various technical scopes of knowledge. The author proposes subdivisions--reconnaissance, planning, and management--within which all groundwater files, studies, and reports may be included. Under each subdivision are listed specific types of projects. The reconnaissance level provides general or preliminary assessment of groundwater resources and establishes the framework for future studies. The planning level provides quantitative detail for general planning and identification of possible management alternatives. The management level provides for accurate projection of the effects of management alternatives and development of optimum management schemes. Examples of each level are as follows: reconnaissance-describes range of groundwater quality for each principal unit; planning-describes the effects of man's activities on groundwater quality; and management-projects the effects of man's activities on groundwater quality. (Cassar-FRC)
W81-04589

CONVECTIVE HEAT TRANSFER IN SELECTED GEOLOGIC SITUATIONS,
Utah Univ., Salt Lake City. Dept. of Geology and Geophysics.
K. Kilty, and D. S. Chapman.
Ground Water, Vol 18, No 4, p 386-394, July-August, 1980. 8 Fig, 24 Ref.

Descriptors: *Geothermal studies, *Heat transfer, *Convection, Heat flow, Thermal conductivity, Model studies, Groundwater movement, Conduction, Geophysics, Geologic fractures, Aquifers, Recharge, Base flow, Mathematical studies.

Although convective heat transfer by groundwater is a common phenomenon, it is difficult to treat analytically. A simple model was proposed and applied to three different field situations. This demonstrated that groundwater movement at very low rates transfers a significant amount of heat and is often the dominant factor in determining subsurface temperatures. The first example, a thermal anomaly on the Hartville uplift, Wyoming, was well approximated by the model, providing a possible explanation for heat flow anomalies caused by other than tectonic or geothermal factors, as well as some qualitative information on groundwater flow and geologic structure. The second example, a fault-controlled geothermal system at Monroe, Utah, with maximum temperature of 150C, shows how convection controls the subsurface temperature distributions in an extreme situation. It shows that small hot springs may exist in the absence of magma or extremely deep convection patterns. Comprehensive measurements of temperature and thermal conductivities and detailed knowledge of geological structures of the Luanshya copper mine, Zambia, the third case study, made possible some estimations of flow geometry and recharge rates. (Cassar-FRC)
W81-04590

DETAILS OF HYDROCHEMICAL VARIATIONS IN FLOWING WELLS,
Birmingham Univ. (England). Dept. of Geological Sciences.
J. M. Marsh, and J. W. Lloyd.
Ground Water, Vol 18, No 4, p 366-373, July-August, 1980. 5 Fig, 2 Tab, 7 Ref.

Descriptors: *Aquifers, *Chemical properties, *Well casings, Casings, Corrosion, Water pollution sources, Wells, Groundwater, Stagnant water, Electrical conductivity, Hydrogen ion concentration, Hydrogeology, Trace elements, Observation wells, Artesian wells, Water quality, Variability.

Representative samples of groundwater taken from a non-flowing steel-cased well can be obtained either by flushing all stored water or by using a sampling tube to ensure that the water is taken directly from the aquifer. Chemical changes occurring in steel-cased wells in the Middle Jurassic Lincolnshire Limestone aquifer of England were measured by analyzing samples of water at different stages during the flushing process. Compared with aquifer water, the stored water was higher in pH, lower in temperature, lower in total dissolved solids, and variable in Eh and electrical conductivity. These factors may be monitored and used in the field to determine the time of complete flushing. If casing dimensions and flow rate are known, flushing time may be calculated. Trace metal concentrations (Cr, Mn, Fe, Co, Ni, Cu, Zn, La, and Pb) were generally higher in the stagnant casing water than in the aquifer. This is attributed to corrosion or abrasion of the metal casing. (Cassar-FRC)
W81-04591

FLOWMETER ANALYSIS AT RAFT RIVER, IDAHO,
Geological Survey, Denver, CO. Water Resources Div.
U. Schimschal.
Ground Water, Vol 19, No 1, p 93-97, January-February, 1981. 7 Fig, 5 Ref.

Descriptors: *Hydraulic conductivity, *Injection wells, *Geothermal studies, Flow measurement, Water loss, Borehole geophysics, Raft River, *Idaho, Flowmeters, Wells, Aquifers.

Field hydraulic conductivity was estimated by a quantitative evaluation of borehole impeller flowmeter data obtained during an injection test of a geothermal well at Raft River, Idaho. This method may only be used for aquifers below the water table. Both stationary and trolling calibrations of the flowmeter were made. Variations in hole diameter, impeller speed, and trolling speed were compensated. Water losses from the well to the formation were determined as a function of depth. The apparent hydraulic conductivities must be considered related to fractures and vugular openings in a rock matrix of relatively small permeability. The computer hydraulic conductivity values represent averages over a given rock interval due to one or more conductive openings. However, this method is useful in indicating broad zones of increased fluid loss. (Cassar-FRC)
W81-04592

MILLENNIAL CELEBRATION OF KARAJI'S HYDROLOGY,
Tehran Univ. (Iran). Dept. of Civil Engineering.
H. Pazwash, and G. Mavrigian.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 107, No HY3, p 303-309, March, 1981. 24 Ref.

Descriptors: *Hydrologic cycle, *Geohydrology, Groundwater, History, Hydrology, Underground structures, Water conveyance, Karaji.

A brief account of Mohammed Karaji, a Persian scholar of the tenth century, and his contributions to science, and especially to groundwater hydrology, is presented. Karaji wrote the first algebra text presented with symbolism. In engineering, he invented instruments that proved useful in surveying and in the tunneling of underground channels for conveying water. Most importantly, he expounded the basic principles of hydrology, understanding the proportionality law between the force of gravity and the mass of a body. Karaji noted that groundwaters, like surface waters, can be stagnant, and that still waters can be located under vast deserts and lowlands. A recently discovered text by Karaji on 'hidden water' is the oldest known text on groundwater hydrology. (Carroll-FRC)
W81-04605

PERMEATION PROPERTIES OF THE CLARENS FORMATION AQUIFER, SEROWE, BOTSWANA,
E. Martinelli.
South African Journal of Science, Vol 76, No 6, p 274-275, 1980. 1 Fig, 2 Tab, 13 Ref.

Descriptors: *Aquifer testing, *Groundwater flow, *Permeability, Aquifer characteristics, Transmissivity, Clarens Formation, Serowe, Eastern Botswana, *Botswana.

Permeability studies of the Clarens Formation aquifer, formerly known as the Cave Sandstone, Botswana, gave transmissivity values of 1.9 and 2.3 sq meters per day for each of 2 boreholes, similar to those values calculated from the aquifer test program. This supports evidence that intergranular permeation, not vesicles, is the primary mechanism for groundwater flow at the borehole sites. No preferential groundwater zones associated with fractures on other structures were present in the vicinity of Serowe. (Cassar-FRC)
W81-04616

RESISTIVITY INVESTIGATIONS FOR GROUND WATER IN METAMORPHIC AREAS NEAR DHANEAD, INDIA,
Indian School of Mines, Dhanbad. (India).
For primary bibliographic entry see Field 7B.
W81-04634

2G. Water In Soils

SALT RELEASE FROM SUSPENDED SEDIMENTS: A SIMULATION MODEL,
Utah Agricultural Experiment Station, Logan.
For primary bibliographic entry see Field 2K.
W81-04304

SEASONAL VARIATION OF INFILTRATION CAPACITIES OF SOILS IN WESTERN OREGON,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
M. G. Johnson, and R. L. Beschta.
Forest Service, Pacific Northwest Forest and Range Experiment Station, Research Note PNW-373, (1981) 8 p, 3 Fig, 1 Tab, 13 Ref.

Descriptors: *Infiltration rate, *Infiltration capacity, *Seasonal variation, *Forest soils, Forest hydrology, Precipitation, Soil organic matter, Wettability, Soil water, *Oregon.

Infiltration measurements were made at two locations in different watersheds in Western Oregon. In both locations the infiltration capacities were greater in the fall than in the summer. The soil receiving the lower annual precipitation had infiltration rates of 8.42 and 12.33 cm/h for summer and fall, respectively, while the comparable figures for the soil with the higher precipitation rate were 6.89 and 12.11 cm/h. These results contrast with those measured in other studies. It is possible the decrease in infiltration capacity in the summer is because the soil surface becomes non-wettable as a result of changes in soil organic matter caused by the hot and dry conditions. These changes in infiltration rates may exceed effects due to applied treatments in forested areas, and so their use is limited until they are more clearly unerstood. (Brambley-SRC)
W81-04371

ABSORPTION OF WATER BY SOIL: SOME EFFECTS OF A SATURATED ZONE,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).
D. E. Smiles, K. M. Perroux, and S. J. Zegelin.
Soil Science Society of America Journal, Vol 44, No 6, p 1153-1158, November-December, 1980. 7 Fig, 25 Ref.

Descriptors: *Absorption, *Soil water, *Physical properties, Diffusion coefficient, Soil properties, Soil analysis, Saturated soils, Mathematical models, Transmission coefficients, Wetting front, Hydraulic conductivity, Darcys law, Flow.

Absorption by soil of water supplied at constant pressure and at constant rate is described, with emphasis on instances in which surface water potential is greater than that at which soil saturates. Sorption experiments and experiments to define the water potential at which soil first attains satiation, the hydraulic conductivity, and the soil water diffusivity were conducted. Each employed vertical plexiglass columns packed with fine sand for which moisture and pressure could be determined or controlled. Analyses which integrated Darcy's law for saturated and unsaturated regions predicted behavior in accord with the experimental data. Analyses which treated the unsaturated region separately were correct only under certain conditions for soil water diffusivity. Results suggest that the measurement of diffusivity be preceded by an independent measurement of moisture. (Titus-FRC)
W81-04442

SOLUTE TRANSPORT IN AGGREGATED POROUS MEDIA: THEORETICAL AND EXPERIMENTAL EVALUATION,
Florida Univ., Gainesville. Dept. of Soil Science.
P. S. C. Rao, D. E. Rolston, R. E. Jessup, and J. M. Davidson.
Soil Science Society of America Journal, Vol 44, No 6, p 1139-1146, November-December, 1980. 4 Tab, 7 Fig, 35 Ref.

Descriptors: *Mass transfer, *Solute transport, *Mathematical models, *Porous media, Sensitivity analysis, Simulation analysis, Soil water, Chloride, Velocity, Interstitial water, Differential equations, Flow, Graphical analysis, Porosity.

Two conceptual solute transport models were verified using experimentally derived breakthrough curves and coefficients. In both models convective-dispersive solute transport was assumed to be limited to the interaggregate pore-water region, and pore-water was assumed to behave as a diffusion sink/source for solute. In the first model Fick's second law described the rate of solute transport. The second model assumed that the rate was proportional to the concentration difference between the two regions. In this model the value of the mass transfer rate coefficient was found to vary with aggregate radius, time, and pore-water velocity. For both models, agreement between calculated and measured breakthrough curves at all velocities was good. Because the second model does not require an explicit geometric description of the porous medium, it may be of more immediate practical use in estimating transport in well-structured field soils. (Titus-FRC)
W81-04443

FIRST INTEGRALS OF THE DIFFUSION EQUATION; AN EXTENSION OF THE FUJITA SOLUTIONS,
Griffith Univ., Nathan (Australia).
J. Y. Parlange, R. D. Braddock, and B. T. Chu.
Soil Science Society of America Journal, Vol 44, No 6, p 908-911, November-December, 1980. 2 Tab, 14 Ref.

Descriptors: *Differential equations, *Soil water, *Adsorption, Boundaries, Mathematical models, Numerical analysis.

Certain solutions of nonlinear differential equations can be obtained without numerical or analytical integration. Such solutions exist when diffusivity is related to the water content via a power law. They include the constant diffusivity solution, the delta-function solution, and the Fujita solutions. For all of these a first integral exists. It is also possible to show that sorptivity has a dependence on the surface water content which obeys a power law. The equations for conditions to be satisfied in these solutions are identified and described. (Titus-FRC)
W81-04444

GENERAL CRITERIA FOR THE VALIDITY OF THE BUCKINGHAM-DARCY FLOW LAW,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
G. Sposito.
Soil Science Society of America Journal, Vol 44, No 6, p 1159-1168, November-December, 1980. 30 Ref.

Descriptors: *Darcys law, *Mathematical models, *Soil water, Saturation, Soil analysis, Hydraulic conductivity, Fourier analysis, Flow, Density, Physical properties, Statistical methods, *Unsaturated flow.

A set of general physical criteria for the validation of the Buckingham-Darcy flow law in unsaturated soils is developed from first principles. The Buckingham-Darcy flow law is an empirial description of the flux density vector. Flux density, mass density, and the energy density of transported matter are three principal variables in hydrodynamics. This study is based on the premise that only the first two are relevant to the macroscopic description of water flow through unsaturated soil. First, it is shown that a momentum balance equation by Raats and Klute describes the flow of water through unsaturated soil in accord with the Buckingham-Darcy law. Next, an equation of motion is derived for the Fourier component of water mass flux density, and the general physical criteria required for accuracy in the Raats-Klute equation are deduced. The criteria are that (1) water mass density and mass flux density constitute strongly coupled variables, and (2) the time scale over which these two variables change significantly is much longer than that over which any other dynamic quantities vary. (Titus-FRC)
W81-04445

2H. Lakes

PHYTOPLANKTON WATER QUALITY RELATIONSHIPS IN U.S. LAKES, PART VIII:

ALGAE ASSOCIATED WITH OR RESPONSIBLE FOR WATER QUALITY PROBLEMS,
Environmental Monitoring Systems Lab., Las Vegas, NE.
For primary bibliographic entry see Field 5C.
W81-04380

LIMNOLOGY OF MICHIGAN'S NEARSHORE WATERS OF LAKES SUPERIOR AND HURON,
Michigan Dept. of Natural Resources, Lansing. Water Quality Div.
R. E. Basch, C. H. Pecor, R. C. Waybrant, and D. E. Kenaga.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-224686, Price codes: A09 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/3-80-059, July, 1980. 189 p, 12 Fig, 20 Tab, 96 Ref, 20 Append.

Descriptors: *Limnology, *Trophic lvel, *Nutrients, *Pesticides, *Lake Superior, *Lake Huron, *Water quality, Eutrophication, DDT, Dieldrin, Mercury, Polychlorinated biphenyls, Phytoplankton, Zooplankton, Fish, Water pollution.

Limnological assessments, including water and sediment chemistry, bacterial densities, zooplankton and phytoplankton and benthic macroinvertebrate community structure, and fish contaminants, were performed at 24 locations in Michigan's nearshore waters of Lakes Superior and Huron in 1974 and 1975. The nearshore waters of Lake Superior were all oligotrophic with generally high water quality as reflected by consistently high dissolved oxygen, reactive silica and nitrate, and low phosphorus, total dissolved solids (TDS), chlorophyll a and bacterial densities. A statistical trend analysis based on 1974 through 1976 (GLECS) data indicated significant increases in the concentrations of dieldrin, DDT and mercury in Lake Superior lake trout. These same data show no statistical changes in PCB concentrations from 1974 to 1976. The nearshore waters of Lake Huron were oligotrophic in the northern section and became mesotrophic at the southern end of the lake. Eutrophic conditions were found at Alpena harbor and Saginaw Bay. Areas of severe water quality degradation occurred at Alpena and Saginaw Bay as a result of large inputs of phosphorus and TDS. A statistical analysis based on 1975 through 1978 GLECS data suggested a peak in 1976 for dieldrin, DDT and mercury in Lake Huron lake trout. The same data showed no statistical changes in PCB concentrations from 1975 through 1978. (Author's abstract)
W81-04390

TRANSPORT OF HEAT AND NUTRIENTS ACROSS A THERMOCLINE,
Technische Hogeschool Twente, Enschede (Netherlands).
P. J. de Bruijn, L. Lijklema, and G. van Straten.
Water Science Technology, Vol 13, No 2 p Tor 751-765, 1981. 6 Fig, 1 Tab, 4 Ref.

Descriptors: *Nutrients, *Thermocline, Thermal stratification, Isotherms, Heat transfer, Heat, Entrainment, Mathematical studies, Lakes, *Artificial lakes, Mass transfer.

A study of man-made lakes in the Netherlands considered the use of temperature data in the calculation of heat and mass transfer across the thermocline due to both diffusion and entrainment. Vertical diffusivity, varying in space and time, was estimated by means of the flux gradient method. This method leads to enhanced values for the thermocline depth if entrainment occurs. Values of turbulent diffusivity obtained for the region just above the thermocline endorse Welander's theory predicting a linear relation between vertial eddy diffusion coefficient and the squared Brunt-Vaaisela frequency. Values of diffusivity obtained for regions just below the thermocline, deviating from the predictions, suggest a supply of vertical momentum to the thermocline from the lower hypolimnion. (Baker-FRC)
W81-04431

THE CHEMICAL CONTROL OF THE WATER HYACINTH (EICHHORNIA CRASSIPES (MART.) SOLMS),
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 4A.
W81-04437

SEDIMENTATION RATES IN FAYETTEVILLE GREEN LAKE, NEW YORK, U.S.A.,
Massachusetts Univ., Amherst. Dept. of Zoology.
For primary bibliographic entry see Field 2J.
W81-04446

ANNUAL LAMINATIONS IN THE SEDIMENTS OF LOE POOL, CORNWALL,
Joensuu Univ. (Finland). Karelian Inst.
For primary bibliographic entry see Field 5B.
W81-04463

NEAR-SURFACE TURBULENCE MEASUREMENTS IN A LAKE,
Oregon State Univ., Corvallis. SChool of Oceanography.
T. M. Dillon, J. G. Hansen, and M. D. Pearson.
Nature, Vol 290, No 5805, p 390-392, April 2, 1981. 2 Fig, 15 Ref.

Descriptors: *Turbulence, *Water circulation, *Waves, Winds, Scaling laws, Kinetic energy, Turbulent boundary layers, Mixing, Boundary layers, Energy transfer, Surface waters, *Lakes.

Turbulence in the near-surface zone of Green Peter Reservoir, Oregon, was studied using a temperature probe capable of estimating the rate of which the kinetic energy of turbulence is dissipated. The resulting temperatue profile showed an active surface mixing layer to a depth of 6 m and a strong seasonal thermocline at 7 m. Dissipation was inversely proportional to depth, and experimental results agreed with independently measured values. To a first approximation, scaling laws devised to describe dissipation in the atmospheric boundary layer may be applicable in the near-surface water. Further research is necessary to determine whether scaling will hold during large wind speeds and breaking surface waves. (Cassar-FRC)
W81-04464

NITROGEN FIXATION (ACETYLENE REDUCTION) IN A DANISH LAKE,
State Laboratory for Soil and Crop Research, Lyngby (Denmark).
M. H. Ahmad.
Environmental Pollution (Series A), Vol 24, No 3, p 167-175, 1981. 3 Fig, 1 Tab, 25 Ref.

Descriptors: *Nitrogen fixation, *Eutrophic lakes, *Seasonal variation, Lakes, Phosphorus, *Denmark, Lyngby, Diurnal distribution, Chemical reactions.

Although a variety of aspects relating to the many eutrophic lakes around Copenhagen city (Denmark) and its suburbs have been investigated, no lake had previouly been investigated for nitrogen fixation, which is an important input of combined nitrogen to lake ecosystems. The nitrogen fixation (acetylene reduction), seasonal and diurnal variations of nitrogenase activities, and some of the chemical factors influencing nitrogen fixation in Lyngby Lake were examined. The rate of nitrogen fixation during the seasonal cycle fluctuated and was shown to vary with respect to sampling data, in situ temperature, sampling depth, and transparency of the lake water. Nitrogenase activity began in May, with the maximal activity occurring in July. There was a gradual decline in nitrogenase activity after July, and no activity was observed from December to April. Chemical analyses of water showed that nitrogenase activity and levels of inorganic combined nitrogen were inversely correlated. However, not much change was observed in the phosphorus content of the water throughout the investigation. When daily fluctuations of nitrogenase activities were studied, activity was low at night, increased rapidly with morning, and was followed by a slow rise during the day, with a maximum at noon. (Carroll-FRC)
W81-04475

OXYGEN DEPLETION AND ANOXIA IN THE CENTRAL AND WESTERN BASINS OF LAKE ERIE, 1973-1975,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
For primary bibliographic entry see Field 5C.
W81-04478

TRANSPARENCY, CONDUCTIVITY AND TEMPERATURE SURVEYS IN THE CENTRAL AND WESTERN BASINS OF LAKE ERIE,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
J. E. Zapotosky.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-107070, Price codes: A17 in paper copy, A01 in microfiche. In: Lake Erie Nutrient Control Program: An Assessment of Its Effectiveness in Controlling Lake Eutrophication, Environmental Protection Agency Report EPA-600/3-80-062, July, 1980. p 103-117, 8 Fig, 1 Tab, 7 Ref.

Descriptors: *Water quality, *Transparency, *Specific conductivity, *Water temperature, *Lake basins, Secchi disks, Seasonal variation, Hypolimnion, Epilimnion, Thermal stratification, Shallow water, Water quality standards, *Lake Erie basin.

The surveys were conducted from 1973-1975, for comparison with results from previous studies. Secchi values for both the central and western basins showed a gradual increase in depth from April through August and a general decrease in depths thereafter. This phenomenon is more apparent in the central basin, which showed greater peak values for 1973-1975 than for 1969-1971. These figures were lower, but similar over time for the western basin. Central basin conductance values were usually higher than western basin values (291.32 and 259.89, respectively for 1974) and follow a general pattern of decreasing in late spring and increasing from September onwards. Hypolimnetic values increase linearly, while epilimnion values are more variable. In both basins, from April-December 1974, the average conductance values were within the International Joint Commission recommended level of less than 308 micromhos. The western basin values apparently vary inversely with the Detroit River discharge, a relationship probably modified by wind-induced mixing. The central basin is isothermal throughout winter and early spring with stratification occurring in lake May or June and lasting about 100 days. Because of its shallow depth, the western basin rarely stratifies, and when it does, it is only for short periods of time. (Brambley-SRC)
W81-04479

LAKE ERIE WINDS: A PRELIMINARY ANALYSIS, 1973-1975,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
D. L. Wise.
In: Lake Erie Nutrient Control Program: An Assessment of Its Effectiveness in Controlling Lake Eutrophicaton, Environmental Protection Agency Report EPA-600/3-80-062, July, 1980. p 118-130, 2 Fig, 2 Tab, 12 Ref.

Descriptors: *Lakes, *Wind velocity, Data acquisition, Seasonal variation, Environmental effects, Wind direction, Lake breezes, *Lake Erie.

A primary objective of this study was the development of a methodology to estimate the surface wind field of Lake Erie, with a secondary objective of developing a quick and simple means of assessing the winds until the primary method was operational. Hourly wind data obtained for 1973-1975 were analyzed to determine the resultant wind speed; the direction of the resultant wind; the persistance of the wind; and the mean wind speed. The annual resultant wind is from the west-southwest at approximately 5.0 mph. The resultant wind velocity is greatest in the late fall with a secondary

maximum in the spring. The minimum resultant wind velocity and minimum mean wind velocity are always in late summer. In April-June 1975 both the resultant and mean wind velocities were lower than the previous two years and the resultant wind was more westerly. Such differences in the wind are an important element in assessing the physical, chemical, or biological processes occurring in the lake. (Brambley-SRC)
W81-04480

CHLOROPHYLL A AND PHEOPIGMENT DISTRIBUTION IN THE CENTRAL AND WESTERN BASINS OF LAKE ERIE,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
L. A. Fay, and D. E. Rathke.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-107070, Price codes: A17 in paper copy, A07 in microfiche. In: Lake Erie Nutrient Control Program: An Assessment of Its Effectiveness in Controlling Lake Eutrophication, Environmental Protection Agency Report EPA-600/3-80-062, July, 1980. p 175-230, 31 Fig, 13 Tab, 17 Ref.

Descriptors: *Lake basins, *Chlorophyll, *Pigments, *Seasonal variation, Eutrophication, Mesotrophy, Organic carbon, Algae, Water pollution, *Lake Erie basin.

Chlorophyll a and pheopigment a were measured from 1973-1975 to observe seasonal and yearly trends. Shoreline versus open lake concentrations were also examined. Of the 2,332 corrected chlorophyll a measurements taken, 98% of the values ranged between 0.34 and 29.12 microgram/l, with a mean of 7.50 microgram/l. The western basin has consistently larger chlorophyll amounts, averaging 2.31-3.15:1 compared with the central basin. The seasonal maximum for the western basin was in the summer, while the central basin had two, in the early spring and early fall. The June-November chlorophyll a concentrations have been increasing since 1967, with the greatest increases occurring from 1974-1975. The western basin and the western half of the central basin were considered eutrophic, with the eastern half of the central basin mesotrophic. The pheopigment a concentrations ranged from 0.27-2.60 microgram/l in the central basin, and 1.09-5.93 microgram/l in the western basin. The concentrations of pheopigments and particulate organic carbon increased during periods of maximum resuspension, while chlorophyll concentrations decreased. (Brambley-SRC)
W81-04482

ZOOPLANKTON DISTRIBUTION IN THE CENTRAL AND WESTERN BASINS OF LAKE ERIE,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
D. D. Larson, and D. E. Rathke.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-107070, Price codes: A17 in paper copy, A01 in microfiche. In: Lake Erie Nutrient Control Program: An Assessment of Its Effectiveness in Controlling Lake Eutrophication, Environmental Protection Agency Report EPA-600/3-80-062, July 1980. p 272-293, 8 Fig, 3 Tab, 37 Ref.

Descriptors: *Lake basins, *Zooplankton, *Rotifers, *Copepods, *Crustaceans, *Seasonal variation, *Species composition, Population density, Biomass, Nutrients, Enrichment, *Lake Erie basin.

Zooplankton samples were collected from 51 western and central basin stations during May-November 1974, to determine species composition and seasonal succession of rotifers, cladocerans and copepods; and to relate the biomass to physical, chemical, and biological parameters. Rotifers comprised 6-40% of the zooplankton biomass in the western basin. Numerical differences in rotifer concentrations varied from basin to basin, and over time. Large numbers of cladocerans were observed in both basins, with early summer and autumn pulses. In the late summer and fall, cladocerans comprised the highest percentage (55%) of the biomass. Cyclopoid copepods were dominant over calanoid copepods throughout the season, with a maximum of total copepods in June and July followed by a steady decline. The large numbers of rotifers and replacement of calanoid copepods by cladocerans and cyclopoid copepods are considered to be indicative of enriched conditions in these basins. (Brambley-SRC)
W81-04484

BENTHIC MACROINVERTEBRATE DISTRIBUTIONS IN THE CENTRAL AND WESTERN BASINS OF LAKE ERIE,
Ohio State Univ., Columbus. Dept. of Entomology.
N. W. Britt, A. J. Pliodzinskas, and E. M. Hair.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-107070, Price codes: A17 in paper copy, A01 in microfiche. In: Lake Erie Nutrient Control Program: An Assessment of Its Effectiveness in Controlling Lake Eutrophication, Environmental Protection Agency Report EPA-600/3-80-062, July, 1980. p 294-330, 29 Fig, 6 Tab, 25 Ref.

Descriptors: *Lake basins, *Benthic fauna, *Macroinvertebrates, *Species composition, *Species diversity, Water quality, Oligochaetes, Molluscs, Midges, Aquatic environment, Water pollution, Tolerance, *Lake Erie basin.

The benthic macroinvertebrates were sampled at 52 stations during the period June 1973 to October 1974, to investigate changes in this community compared with previous studies. A total of 66 taxa was identified, of which the Oligochaeta made up 20.9% and averaged 61.9% of all individuals. Thirty-size taxa were found throughout both basins, while 11 and 19 are limited to the western and central basins, respectively. Species diversity ranged from 0-15 at different stations; with the increased diversity resulting from Oligochaeta taxa. Molluscs are represented by 16 taxa, of which the sphaeriid clams are the most important, with ubiquitous distribution. Ten chironomid taxa were identified, with one having ubiquitous distribution. The remaining 15 taxa, comprising 8% numerically, were 6 leeches, 2 amphipods, 1 isopod, 1 opposum shrimp, 1 polychaete, 1 coelenterate, 1 caddisfly, and 2 flatworm families. The average numerical faunal densities were 2612 and 3719/sq m, respectively, for the western and central basins. While these densities are much higher than those found in 1963-1964, the increase is due to greater numbers of pollution-tolerant taxa, while the decline of pollution-sensitive taxa has continued. (Brambley-SRC)
W81-04485

KINETICS OF SEDIMENT OXYGEN DEMAND,
Illinois State Water Survey, Peoria.
W. Wang.
Water Research, Vol 15, No 4, p 475-482, April, 1981. 7 Fig, 4 Tab, 17 Ref.

Descriptors: *Lake sediments, *Oxygen demand, *Kinetics, Water quality, Dissolved oxygen, Biochemical oxygen demand, Sedimentology, Mathematical equations, Suspended sediments, Oxygen uptake, Limnology, Iron, Oxidation.

A series of lake bottom sediment samples were examined to determine the sediment demand for dissolved oxygen (SOD) as part of a study to define the effects of lake bottoms on the overlying water column. When using a batch method, SOD was expressed in terms of oxygen uptake, and was determined as the difference in biochemical oxygen demand of a settled and a suspended sediment. For small amounts of sediment, the oxygen uptake was independent of the initial oxygen present. A mathematical relationship was formulated to explain the kinetics of the SOD reaction in a batch method. The SOD was proposed to be equal to the sum of the product of a reaction rate constant and the log of the reaction time and SOD sub 1. This empirical relationship was explained in terms of an inhibition effect which occurs through the oxidation of iron (Fe2+) on the sediment surface. When an insoluble coating is formed (Fe3+), the rate of oxidation is presumably decreased, reducing the oxygen uptake at the surface of the sediment. Unlike dissolved oxygen determinations, the SOD measurement provides insight into the aspects of negative oxygen tension. (Geiger-FRC)
W81-04558

CHLOROPHYLL-PHOSPHORUS RELATIONS IN INDIVIDUAL LAKES. THEIR IMPORTANCE TO LAKE RESTORATION STRATEGIES,
Minnesota Univ., Minneapolis. Limnological Research Center.
For primary bibliographic entry see Field 5C.
W81-04580

A LIMNOLOGICAL STUDY ON LAKE NASSER AND THE NILE IN EGYPT,
Alexandria Univ. (Egypt). Dept. of Oceanography.
M. A. H. Saad.
Water Supply and Management, Vol 4, No 1/2, p 81-92, 1980. 6 Fig, 66 Ref.

Descriptors: *Water quality, *Lake Nasser, *Nile River, Egypt, Physical properties, Chemical properties, Hydrogen ion concentration, Silicates, Nitrogen compounds, Nitrates, Nitrites, Phosphorus compounds, Organic matter, Dissolved oxygen, Optical properties, Chlorides, Mixing, *Limnology.

Water samples were collected at Lake Nasser near the High Dam and at 7 stations along the Nile River to document the chemical and physical variations along the lower stretch of the river. In the lake, the Secchi value was 240 cm; in the river, 35-200, depending on currents and turbidity. Temperatures in the lake increased slightly with depth, 17.7 C at the surface to 18.3 at the bottom. No thermal stratification was present. Surface water in the river ranged from 18.0-19.5 C. pH varied slightly in the vertical water column of the lake, from 8.67 to 8.74. River pH varied from 8.3-8.5 at the first 6 stations to 7.2 at the most seaward station. This low value was attributed to a decrease in phytoplankton and high chloride content. Chloride in the lake ranged from 3.8 mg per liter at the surface to 23.28 mg per liter at 10 meters depth. Dissolved oxygen in the lake fluctuated between 7.04 mg per liter at 60 meters to 12.8 mg per liter at 50 meters (the surface was 9 mg per liter). Nutrients were as follows: nitrate (mg per liter)--lake, 1.25-4.20, and river 2.03-4.45; nitrite (micrograms per liter)--lake, 64-137, and river, depleted in several stations; total phosphate (micrograms per liter)--lake, 175-535, and river, 144-302; silicates (mg per liter)--lake, 10.2-130, and river, 11.2-3.2, decreasing toward the outlet; dissolved organic matter (mg per liter)--lake, 1.56 at the surface to 10.63 at 30 meters, and river, 2.65-4.22. (Cassar-FRC)
W81-04603

RECENT INVESTIGATIONS ON PHYSICAL LIMNOLOGY IN LAKE BIWA RELATING TO ENVIRONMENTAL PROBLEMS(IN JAPANESE),
Kyoto Univ. (Japan). Diasters Prevention Research Inst.
S. Okuda.
Japanese Journal of Limnology, Vol 41, No 3, p 147-152, July, 1980. 1 Fig, 9 Ref.

A general outline of limnological studies of Lake Biwa, Japan, is reported. Observations on water circulation show a counterclockwise current in the northern basin and southern basin, with clockwise circulation in the central part. In the southern basin, lake currents are controlled by the prevailing wind. Substances transported by rivers into the lake and their dispersion are discussed. Bottom muds were studied to determine the effects of seasonally released nutrients (ammonium) on the water quality of the lake. Several educational institutions participated in different aspects of this survey. (Cassar-FRC)
W81-04632

GEOGRAPHICAL VARIATIONS IN BODY SIZE, BROOD SIZE AND EGG SIZE OF A FRESHWATER SHRIMP, PALAEMON PAUCI-

DENS DE HAAN, WITH SOME DISCUSSION ON BROOD HABITAT,
Kyoto Univ. Otsu (Japan). Otsu Hydrobiological Station.
For primary bibliographic entry see Field 6G.
W81-04644

2I. Water In Plants

GROWTH-SUSTAINING WATER POTENTIAL DISTRIBUTION IN THE PRIMARY CORN ROOT,
California Univ., Davis. Dept. of Land, Air, and Water Resources.
W. K. Silk, and K. K. Wagner.
Plant Physiology, Vol 66, No 5, p 859-863, November, 1980. 5 Fig, 20 Ref.

Descriptors: *Plant water potential, *Plant morphology, *Corn, Water requirement, Hydraulic conductivity, Graphical analysis, Plant growth, Plant tissue, Velocity, Flow, Laminar flow, Algorithms, Mathematical models, Differential equations, *Soil-water-plant relationships.

An equation is derived from transport theory to relate local growth rate to local water potential in an expanding tissue. The equations are phenomenological rather than mechanistic. They employ a model of the corn root as a noncompartmented system. In this model the relative elemental growth rate equals the divergence of the product of hydraulic conductivity and the gradient of water potential. The water potential required to sustain growth decreases from outside to inside the root. This approach does not address the role of air spaces and components of plant tissue which do not accumulate water. The most uncertain aspects of the analysis are values for hydraulic conductivity, derived from published reports. (Titus-FRC)
W81-04450

RESISTANCE TO WATER FLOW IN THE INTRA-COLEOPTILE INTERNODE OF WHEAT,
Agricultural Research Inst., Wagga Wagga (Australia). Dept. of Agriculture.
P. S. Cornish.
Plant and Soil, Vol 59, No 1, p 119-125, 1981. 1 Fig, 1 Tab, 8 Ref.

Descriptors: *Agricultural hydrology, *Transpiration, *Planting management, Soil water, Root development, *Wheat, Soil moisture deficiency, Crop production, Australia, Water use efficiency, Subsoil.

Measurements of the number of xylem vessels and their radii in the intra-coleoptile internode (ICI) and seminal roots of five genotypes of wheat indicated that the ICI conducting capacity was close to that of the main seminal axis. This condition would hinder flow with 3-5 seminal axes contributing to the uptake. With deeper sowing, the length of the ICI increased, while the xylem diameter decreased in two of the genotypes, restricting flow even more. Assuming Poiseuille flow, the resistance per unit length of ICI was 0.0004/cm to the 4th power-day MPa. To maintain transpiration under typical field conditions in Southern Australia in the spring, a pressure drop of 0.15 MPa along an ICI 5 cm in length would be required. A second study was carried out on 11 wheat varieties sown up to 10 cm deep. Among varieties with similar maximum coleoptile lengths (6-8 cm), maximum ICI lengths ranged from 316-6.8 cm. It was concluded from these findings that considerable variations in hydraulic resistance are possible with the different combinations of genotypes and planting depths. Such information could also allow potentially useful differences in the rate of subsoil water use to be obtained. (Geiger-FRC)
W81-04451

EFFECT OF WATER TABLE DEPTH AND TILLAGE METHODS ON PLANT-WATER STATUS AND YIELD OF RICE,
International Inst. of Tropical Agriculture, Ibadan (Nigeria).
For primary bibliographic entry see Field 3F.
W81-04452

THE INFLUENCE OF WATER STRESS ON THE PHOTOSYNTHETIC PERFORMANCE AND STOMATAL BEHAVIOUR OF TREE SEEDLINGS SUBJECTED TO VARIATION IN TEMPERATURE AND IRRADIANCE,
Lancaster Univ., Bailrigg (England). Dept. of Biological Sciences.
For primary bibliographic entry see Field 3F.
W81-04465

GENETIC AND SOIL MOISTURE EFFECTS ON THE BRANCHING-ROOT TRAIT IN ALFALFA,
Illinois Univ. at Urbana-Champaign. Dept. of Agronomy.
M. S. McIntosh, and D. A. Miller.
Crop Science, Vol 21, No 1, p 15-18, January/February, 1981. 4 Tab, 10 Ref.

Descriptors: *Crops, *Drought, Agriculture, Moisture deficiency, Water deficit, Water shortage, Water stress, Moisture stress, *Alfalfa, Roots, *Soil-water-plant relationships.

The genetic behavior was investigated of seven alfalfa clones exhibiting a wide range of rooting habit; the effect of soil moisture on the rooting habit of alfalfa was studied; and attempts were made to ascertain whether differences in soil moisture contribute to rooting habit genotype environment interactions. The findings suggest that the branching-root trait is very sensitive to environmental differences, and the parent-progeny relationship for the branching-root trait is low when considered over more than one environment. The expression of the branching-root trait was enhanced in plants grown at Brownstown, Illinois, as opposed to those grown at Urbana. Differences in soil structure between these two locations or low vigor of plants at Urbana due to other local differences were probably the major causes of this difference in plant growth in these two areas. In experiments where some of the plants were grown under moisture-stressed conditions, these plants were severely stressed with lower root-branching scores. Thus it was concluded that soil moisture influences the expression of the branching root habit in alfalfa. Moisture stress conditions which reduced top growth also reduced root-branching. (Baker-FRC)
W81-04572

DROUGHT RESPONSE OF WINTER WHEAT CULTIVARS GROWN UNDER FIELD STRESS CONDITIONS,
South Dakota State Univ., Brookings. Dept. of Plant Science.
D. L. Keim, and W. E. Kronstad.
Crop Science, Vol 21, No 1, p 11-15, January/February, 1981. 1 Fig, 5 Tab, 17 Ref.

Descriptors: *Crop yield, *Drought, *Wheat, Agriculture, Moisture deficiency, Water deficit, Water shortage, Water stress, Moisture stress, *Soil-water plant relationships.

This study was conducted to characterize the expression of drought resistance in winter wheat cultivars when grown under dryland conditions in eastern Oregon. Soil moisture samples taken on June 7 indicated that the cultivars at all three sites were under high moisture stress during the grain-filling period. Osmotic potential was determined from leaf samples taken during the early part of grain filling. The osmotic potential contributed positively to yield differences primarily by way of kernel weight at the least stressed site. Increased osmotic potential contributed to higher yields and kernel weight. The drought-resistant cultivar 'Yamhill' avoided drought stress by maintaining a high plant water status during reproductive development. The high growth rates during heading and anthesis and a high kernel weight demonstrated that this cultivar was not as severely affected by high external water stress as were other types. Other cultivars also demonstrated that both avoidance and tolerance traits contributed to grain yield under drought stress. (Baker-FRC)
W81-04573

2J. Erosion and Sedimentation

DEVELOPMENT OF LONGITUDINAL PROFILES OF ALLUVIAN CHANNELS IN RESPONSE TO BASE-LEVEL LOWERING,
Geological Survey of Israel, Jerusalem.
Z. B. Begin, D. F. Meyer, and S. A. Schumm.
Earth Surface Processes and Landforms, Vol 6, p 49-68, 1981. 15 Fig, 1 Tab, 26 Ref, 2 Append.
OWRT-B-150-COLO(5).

Descriptors: *Erosion, *Alluvial streams, *Gullies, *Armouring, *Mathematical model, Alluvial channels, Degradation, Heat diffusion, Sediment continuity, Sediment transport, Alluvial sediments, Longitudinal profiles, Base-level lowering.

Flumes 15 and 20 meters long with a slope of 0.01 cm/cm were used to study degradation of alluvial channels in cohesive sediments. The base level was lowered to a fixed position, and longitudinal profile development was analyzed through a model formulated as a heat (diffusion) equation, based on the sediment continuity equation with discharge linearly proportional to the channel slope. The basic equation defined bed elevation at any distance and time as a function of the amount of base-level lowering and a diffusion coefficient. Bank erosion and channel armouring problems also were treated successfully with the same model. In homogeneous alluvial sediments not subject to armouring, base-level lowering by a given amount resulted in degradation all along the channel by the same amount. The main erosion impact occurred in the early stages, mainly near the mouth. The degradation rate at any station along the channel reached a peak, then slowly decreased with time; the peak rate was attenuated by distance from the mouth. The model predicted intermediate stages of profile development, at different times, at any distance from the outlet. (Mullen-IPA)
W81-04360

REMOTE SENSING OF NON-POINT SOURCE SEDIMENT IN NORTHERN MAINE,
Maine Univ. at Orono.
For primary bibliographic entry see Field 7B.
W81-04365

EROSION AND SEDIMENTATION DATA CATALOG OF THE PACIFIC NORTHWEST,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
K. R. Larson, and R. C. Sidle.
Forest Service, Pacific Northwest Region, Portland, Oregon, Report, September, 1980. 73 p, 39 Tab, 56 Ref, Append.

Descriptors: *Erosion, *Sediment, *Watersheds, *Forest management, *Soil erosion, Sediment yield, Watershed management, Reservoirs, Small watersheds, Land use, Roadbanks, Erosion rates, Sedimentation rates, *Pacific Northwest.

Since the late 1950's, numerous studies in the Pacific Northwest have been conducted to quantify sediment yields from small watersheds, determine surface soil erosion rates, and evaluate the effects of various forest management practices on erosion and sedimentation rates. The purpose of this catalog is to compile previously summarized erosion and sedimentation data in a form that is easily accessible and readily used by land planners, and soil and water specialists. Data summaries of several types of studies are contained, including: sediment yield data from small watershed research studies; sediment yield data from reservoir sedimentation studies; soil erosion data from plot studies conducted on harvested areas and on road cut and fill slopes; and sediment yield data on large rivers. The natural variability of annual sediment yields from a given watershed and mean annual yields for similar watersheds in a given area are, in many cases, extreme. Any extrapolation of erosion rates or sediment yields to watersheds having similar characteristics should be made with caution. Surface erosion rates reported from plot studies

should not be considered as sediment inputs to the stream system. The rate at which soil is routed to the stream system is highly variable and dependent upon many site specific factors. (Moore-SRC)
W81-04372

MEASUREMENT AND PREDICTION OF EROSION AND SEDIMENT YIELD,
Science and Education Administration, Chickasha, OK. Southern Plains Watershed and Water Quality Lab.
P. B. Allen.
Agricultural Reviews and Manuals ARM-S-15, April, 1981. 25 p, 18 Fig, 4 Tab, 40 Ref.

Descriptors: Sediment yield, *Erosion, Sampling, *Prediction, Field tests, Surface runoff, Large watersheds, Small watersheds, Soil conservation, Costs.

Measurement methods and prediction methods are available for determining sediment yield from watersheds ranging in size from 0.01 acres to 10,000 sq miles. The methods are summarized, their merits and limitations discussed, and the factors involved in selecting a method are considered. Measurement methods for watersheds up to 1 acre include the total runoff tank, multislot divisor and the Coshocton sampler, while for larger watersheds pumping samplers, ponds and reservoirs and hand-operated samplers may be used. The universal soil-loss equation (USLE) may be used for predictive purposes on watersheds of up to 100 acres, while for larger watersheds a modified USLE, USLE and delivery ratio and empirical procedures may be used. The measurement methods are the more accurate, with accuracies within + or - 15%. Measurements over 3-5 years are recommended for reliable results for sediment yields. Costs of sediment yield determination usually increase with accuracy. Some of the samplers may be used or adapted for sampling trace elements, nutrients, and pesticides. (Brambley-SRC)
W81-04373

MOVEMENT AND EFFECTS OF COMBINED SEWER OVERFLOW SEDIMENTS IN RECEIVING WATERS,
Colorado State Univ., Fort Collins. Engineering Research Center.
For primary bibliographic entry see Field 5B.
W81-04375

SEDIMENTATION RATES IN FAYETTEVILLE GREEN LAKE, NEW YORK, U.S.A.,
Massachusetts Univ., Amherst. Dept. of Zoology.
S. D. Ludlam.
Sedimentology, Vol 28, No 1, p 85-96, February, 1981. 4 Fig, 5 Tab, 15 Ref.

Descriptors: *Sedimentation rates, *Paleolimnology, Lakes, Sedimentation, *Lake sediments, Varves, Limnology, *Fayetteville Green Lake, New York.

A method for estimating past sedimentation rates in Fayetteville Green Lake, New York, is described, which utilizes the separating of annual couplets or varves in dried sediment samples. Two measures are presented which represent an upper and lower limit of sedimentation rate estimates. Both measures agree within 5% with recent determinations of the average annual sedimentation rate in couplets. Usually 3 to 5 replicate samples are required to reduce the half-width of 95% confidence intervals on individual couplet sedimentation rates to 30 g/sq m/yr. Lateral variations in sedimentation rate were detected for individual years over the same distance, but no variations were found in sedimentation rates averaged for 13 years over short distances in the profundal zone. Not all of the variation was related to the nonuniform patterns of dark sublaminae and thin turbidities resulting from annual layers. Although precise estimates of sedimentation rates could be determined at different points in the lake, estimates should be gathered from several points to attain accurate annual sedimentation rates for the lake as a whole. (Geiger-FRC)
W81-04446

PARTICULATE MATTER GRAIN-SIZE CHARACTERISTICS AND FLOCCULATION IN A PARTIALLY MIXED ESTUARY,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 2L.
W81-04447

COMPARISON OF METHODS OF SIZE ANALYSIS FOR SANDS OF THE AMAZON-SOLIMOES RIVERS, BRAZIL AND PERU,
Cincinnati Univ., OH. H.N. Fisk Lab. of Sedimentology.
D. W. Jordan, R. C. Tobin, P. Lundegard, N. Samuels, and F. Schauf.
Sedimentology, Vol 28, No 1, p 123-128, 1981. 3 Fig, 2 Tab, 25 Ref.

Descriptors: *Particle size, *Mathematical studies, *Fluvial sediments, Sediment transport, Sediments, Rivers, Frequency analysis, Graphical methods, Sand, Sedimentology, Deltas, Amazon River, Solimoes River, Brazil, Peru.

Cumulative frequency curves and bivariate textural plots of Amazon-Solimoes River sands are not environmentally sensitive. Most of the sands may be plotted as delta (67%), nearshore (18%), fluvial (13%), and dune (2%). Much of the intersample variation in the cumulative curves occurred between 0-5%. Neither sampling technique nor position within the river had a significant effect on bivariate plots or cumulative curves. Size distribution, transport, and final processing of the size distribution were reported to have a stronger influence on the outcome of bivariate plots or cumulative curves. Of the 13% of samples which plotted as fluvial, only one of the nine bivariate plots successfully identified the fluvial environment. (Geiger-FRC)
W81-04448

MECHANICAL EFFECTS OF MICRO-ORGANISMS ON INTERTIDAL BEDFORM MIGRATION,
Institute of Earth Sciences, Utrecht (Netherlands). Comparative Sedimentology Div.
P. L. DeBoer.
Sedimentology, Vol 28, No 1, p 129-132, February, 1981. 3 Fig, 11 Ref.

Descriptors: *Microorganisms, *Sediment erosion, *Mud flats, Watershed management, Algae, Sand, Sediment transport, Shoals, Sandbars, Sand waves, Ripple marks, Sedimentary structures, Tidal flats, Organic matter, Aphotic zone, *Intertidal areas.

It has been shown that algae and suspension feeders may act as binders on muddy tidal flats. The stabilizing effect of microorganisms on sandy sediment surfaces in temperate climates was demonstrated in a simple experiment. Observations of a megaripple were made during several years on an intertidal shoal in the Oosterschelde tidal inlet of the Netherlands. It was also observed that small-scale ripples were more abundant in the sand in the winter, suggesting a stabilizing effect of summer algae. To eliminate organic activity, a copper sulfate solution was poured along a 1 m strip at right angles to the crest of a megaripple during low tide. After two high tide periods, the treated part of the megaripple had been completely eroded, suggesting the role of the surface organic layer in megaripple stabilization. It was speculated that inactivation of algae over a large area would most likely lead to slight surface erosion and increased migration velocity of whole bedforms. Research into the role of the subtidal aphotic zone should be included when evaluating the physical response of sedimentary structures on the behavior of water movements. (Geiger-FRC)
W81-04449

2K. Chemical Processes

SALT RELEASE FROM SUSPENDED SEDIMENTS: A SIMULATION MODEL,
Utah Agricultural Experiment Station, Logan.
S. R. Peterson, J. J. Jurinak, and R. J. Wagenet.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-231839, Price codes: A09 in paper copy, A01 in microfiche. Research Report 62, December, 1980, 149 p, 27 Fig, 23 Tab, 6 Append. OWRT-A-045-UTAH(1), 14-34-0001-9047.

Descriptors: *Chemical reactions, Saline water, *Suspended sediments, *Particle size, Saline soils, Soil water, Diffuse source, Sediment interaction, *Mancos shale.

The effects of particles size, soil to water ratio and time on the rate of release of salts from Mancos Shale derived soils were studied by taking four different size fraction at three different dilutions of soil to water. The kinetic model was formulated using data obtained from a soil dominated by highly soluble salts (evaporites) and using dimensional analysis. The chemical equilibrium model developed in this project was based on ion association theory, with equilibrium constants chosen as the data base. The requisite chemical equations programmed were solved by iterative techniques (successive approximations). The chemical model was interfaced with the kinetic model, thus all input data necessary for the chemical model were produced by the kinetic model; these input data were the total concentrations of individual ions. The equilibrium model accepted these input data and calculated the concentrations, activities, and activity coefficients for all ions and their soluble complexes. The model also predicted which salts were dissolving and by determining the saturation indices how quickly individual mineral salts approached equilibrium.
W81-04304

CALCIUM CARBONATE PRECIPITATION AS INFLUENCED BY STREAM PRIMARY PRODUCTION,
Utah Water Research Lab., Logan.
G. L. Rupp, and V. D. Adams.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-231946, Price codes: A04 in paper copy, A01 in microfiche. Water Quality Series, UWRL/Q-81/02, April, 1981. 60 p, 23 Fig, 16 Tab, 80 Ref, 3 Append. OWRT-A-044-UTAH(1), 14-34-0001-9047.

Descriptors: *Calcium carbonate precipitation, *Primary stream production, *Periphyton photosynthesis, *Macronutrient concentration, Phosphorus interaction, Benthic community, Synoptic study, Minerologic analyses, Radiotracer experiments, Bicarbonate-hardness system, Water quality, Sodium absorption ration, Total dissoled solids, Stream diversion, Metal toxicity, Algal blooms, Aquatic production, Utah, Logan River.

The water chemistry, hydrology, and benthic primary production of the Logan River, in the Bear River Mountains in northern Utah, were monitored for one year to study the potential influence of periphyton photosynthesis on calcium carbonate precipitation in the river. Radioisotopic tracers were used to measure periphyton photosynthesis and calcium carbonate precipitation concurrently in laboratory experiments to investigate the effects of water temperature, velocity and macronutrient concentration on calcium carbonate precipitation induced by photosynthesis. Precipitation did not correlate with nutrient content, but did with temperature, being greatest at 10C; benthic precipitation decreased inversely with water velocity. These results suggest that biological activity would have the greatest effect in high altitude streams, declining in importance downstream. Biological activity may account for as much as 25% calcium carbonate precipitation in the Logan River during certain times of the year. (Mullen-IPA)
W81-04316

A HYDROLOGIC CARBONATE CHEMISTRY MODEL OF FLOODED RICE FIELDS,
Arkansas Water Resources Research Center, Fayetteville.
For primary bibliographic entry see Field 4B.
W81-04317

LONG-TERM CHEMICAL-QUALITY CHANGES IN SELECTED DELAWARE STREAMS,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-04332

CHLORIDE IN NATURAL CONTINENTAL WATER--A REVIEW,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W81-04333

CHEMISTRY OF MONSOON RAIN WATER AT DELHI,
Jawaharlal Nehru Univ., New Delhi (India). School of Environmental Sciences.
For primary bibliographic entry see Field 2B.
W81-04625

2L. Estuaries

PARTICULATE MATTER GRAIN-SIZE CHARACTERISTICS AND FLOCCULATION IN A PARTIALLY MIXED ESTUARY,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
K. Kranck.
Sedimentology, Vol 28, No 1, p 107-114, February, 1981. 6 Fig, 27 Ref.

Descriptors: *Flocculation, *Particle size, *Suspended solids, *Estuaries, Inorganic compounds, Organic matter, Turbidity, Sedimentation, Mixing.

The concentration, grain size, and gross composition of suspended matter in the Miramichi Estuary, New Brunswick, were studied with special focus on the effect of flocculation and the partitioning of organic and inorganic material on particle size characteristics. Variations in the concentration of particulate matter were associated with regular changes in grain-size features. The suspended matter in the turbidity maximum region of the estuary was found mostly as large flocculated particles. In estuarine waters with lower particle levels, most of the matter occurred as finer particles. Natural floc modes and inorganic grain modes varied simultaneously at higher suspended particulate concentrations; at lower concentrations, the two modes varied inversely. Variations in organic matter and modal relationships were attributed to variations in the inorganic-organic composition of the flocs. It was suggested that increases in the trapping effect which causes the turbidity maximum were responsible for the increase in settling rates due to flocculation. (Geiger-FRC)
W81-04447

THE SIGNIFICANCE OF MICROBIAL CARBON IN THE NUTRITION OF THE DEPOSIT FEEDING POLYCHAETE NEREIS SUCCINEA,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
L. M. Cammen.
Marine Biology, Vol 61, No 1, p 9-20, 1980. 4 Fig, 2 Tab, 80 Ref.

Descriptors: *Food chains, *Bacteria, *Carbon, Benthos, Biomass, Aquatic life, Dissolved solids, Salt marshes, Marshes, Microbiological studies, *Ecosystems.

An attempt was made to evaluate the importance of microbial carbon in the nutrition of an entire population of deposit feeders on an annual basis. The population of Nereis succinea was apparently unable to assimilate a sufficient amount of microbial carbon to sustain itself during the year of the study. The findings agree with other reports of other deposit feeders and detritivores where the quantity of bacteria consumed was substantially less than the carbon requirement. The level of bacterial carbon in the sediments of this marsh was not unusually low in comparison to other marine sediments. It seems likely that in general, only a small portion of the carbon requirements of nonselective deposit feeders and detritivores is obtained through their consumption of bacteria. The role of direct uptake of nonliving organic carbon, both particulate and dissolved, in the nutrition of deposit feeders and detritivores is unclear. While the potential importance of DOC uptake has been demonstrated in the laboratory, it has not been verified in the real world. (Baker-FRC)
W81-04455

BACTERIOPLANKTON IN THE COASTAL EUPHOTIC ZONE: DISTRIBUTION, ACTIVITY AND POSSIBLE RELATIONSHIPS WITH PHYTOPLANKTON,
Scripps Institution of Oceanography, San Diego, La Jolla, CA. Inst. of Marine Resources.
J. A. Fuhrman, J. W. Ammerman, and F. Azam.
Marine Biology, Vol 60, No 2/3, p 201-207, 1980. 3 Fig, 2 Tab, 32 Ref.

Descriptors: *Phytoplankton, *Coastal waters, Euphotic zone, Eutrophication, Trophic level, Algal growth, Aquatic productivity, *Bacteria, Bights, Southern California Bight.

The distribution of bacterioplankton in the euphotic zone of the Southern California Bight was correlated with the distribution of other biological parameters such as chlorophyll, primary production, and organic particulates. Data were gathered from 27 stations during two cruises of the Southern California Bight Study. With increasing distance from shore, bacterial abundance and thymidine incorporation declines progressively. Similar trends were noted for phytoplankton. The distribution of bacterioplankton and their activity in the Southern California Bight seem more related to in situ processes than to a terrestrial source/oceanic sink of bacterioplankton. Bacterial abundance, thymidine incorporation, and thymidine and glucose turnover rates were all significantly correlated to each other, suggesting they are comparable as relative measures of bacterial activity. Thymidine incorporation per cell was not correlated to bacterial abundance. This suggests density independent specific growth rates. The standing stock of phytoplankton had more of an influence on bacterioplankton growth rate than did the primary production of the phytoplankton. It was concluded that bacterial growth may be stimulated by leakage of dissolved organic matter, not so much from healthy photosynthesizing cells as from phytoplankton being disrupted and incompletely digested during predation by the zooplankton and nekton. (Baker-FRC)
W81-04456

ASPECTS OF THE ECOLOGY OF A SMALL ESTUARINE EMBAYMENT,
Academy of Natural Sciences of Philadelphia, Benedict, MD. Benedict Estuarine Research Lab.
K. Mountford.
Marine Biology, Vol 61, No 1, p 53-67, 1980. 11 Fig, 2 Tab, 40 Ref.

Descriptors: *Estuarine environment, *Ecology, *Chesapeake Bay, Hydrology, Climate, Temperature, Bacteria, Aquatic life, Plankton.

The present study was a range-finding effort to develop a baseline of structural and functional information for later comparative assessment of a brackish embayment on the Western Shore of Chesapeake Bay and similar small estuarine watersheds. Sediment was noted to move alongshore into the cove after rainfall, and erosion caused soil breakdowns from nearby cliffs. The distribution of the intertidal benthos appears to be mediated by the erosion, by ice damage and by predators. Phytoplankton chlorophyll oscillations that were noted in the Bay and Potomac River were not observed in the cove. Cove gross and net photosynthesis averaged the same as the bay, but the cove had higher spring rates, resulting from higher net assimilation ratios rather than from higher biomass. Large numbers of small flagellates were not seen after heavy rainfall flushing. Various factors suggest that leaf litter from the surrounding forest dominated particulate input to the cove. Bacterial counts increased in total numbers as a function of water temperature. Surface counts exceeded bottom counts. Indigenous bird and mammal waste are important bacterial inputs. Rainfall pulses resulted in rapid increases of fecal coliform and fecal streptococcus counts. (Baker-FRC)
W81-04457

TRACE ELEMENTS IN MYTILUS EDULIS L. FROM THE ESTUARY AND GULF OF ST. LAWRENCE, CANADA: LEAD AND CADMIUM CONCENTRATIONS,
Institut National de la Recherche Scientifique, Rimouski (Quebec). Lab. Oceanographique.
D. Cossa, and E. Bourget.
Environmental Pollution (Series A), Vol 23, No 1, p 1-8, September, 1980. 1 Fig, 2 Tab, 36 Ref.

Descriptors: *Cadmium, *Lead, *Mussels, Mytilus, Estuaries, *Trace elements, River mouth, Metals, Water pollution sources, Canada, *Gulf of St. Lawrence.

Cadmium and lead content were determined in the bivalve Mytilus edulis which was systematically sampled along the shores of the estuary and northeastern Gulf of St. Lawrence. Growth rate, sexual maturity, and the surface circulation pattern were determined, and the relationships between these parameters and metal levels in the bivalves were examined. There was a decrease in metal concentrations of mussels toward the Gulf, which appeared to be due to the dilution of relatively metal-rich waters originating in the upper estuary and Saguenay fjord. The results suggested no measureable influence of salinity on uptake. Also, there was no evidence of a relationship between variations in metal concentrations and sexual maturity or growth rate. The variations observed were thought to be due to abiotic factors such as sources of metals, rather than to biotic factors. The high levels found in animals in the western zone were judged not due to mining activities in the area, but resulted from the metal inputs from the numerous rivers which drain this part of the Canadian Shield, which is known for its metallic lode. (Small-FRC)
W81-04474

OBSERVATIONS ON THE PECULIAR DIURNAL MIGRATION OF A RED TIDE DINOPHYCEAE IN TROPICAL SHALLOW WATERS,
Kiel Univ., (Germany, F.R.). Inst. fuer Meereskunde.
U. Horstmann.
Journal of Phycology, Vol 16, No 4, p 481-485, 1980. 8 Fig, 1 Tab, 22 Ref.

Descriptors: *Dinoflagellates, *Behavior, Eutrophication, Light intensity, Red tide, Flagellates, Diurnal distribution, Distribution, Tides, *Philippines, Tropical regions, Tropic zone, Phytoplankton, *Estuarine environment, Maribago Bay.

Observations were made in the area of a bloom of dinoflagellates during March, April and May at Maribago Bay on Mactan Island, Cebu. Peridinium cf. quinquecorne Abe forms red tide-like blooms in eutrophic shallow waters in this area of the Philippines. When intensive solar radiation occurs, the organism moves into a distinct near surface layer. However, this occurs only during the incoming tide. Just prior to the occurrence of the outgoing tide, the red tide disappears, regardless of the prevailing light conditions. In studies conducted in a laboratory on this behavior pattern it was noted that Peridinium began to move into the water at about 1000 hr, but that by late afternoon they have moved into shaded areas and once again attached themselves to the glass sides of the cylinder. Thus it is suggested that, superimposed on its reaction to light, this dinoflagellate may follow intrinsic tide-dependent oscillations. (Baker-FRC)
W81-04619

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

SIGNIFICANT DEVELOPMENTS IN MEMBRANE DESALINATION -- 1979,
Office of Water Research and Technology, Washington, DC.
M. E. Mattson.
Desalination, Vol 28, No 3, p 207-223, March, 1979. 8 Fig, 7 Tab, 7 Ref.

Descriptors: *Desalination, *Membrane filter, *Osmosis, *Brackish water, *Saline water, *Salt rejection, *Electrodialysis, Asymmetric membrane, Composite membrane, Cellulose acetate, Interfacial polymerization, Water flux, Residual chlorine, Permeators, Yuma, Arizona, Jedda, Saudi Arabia.

Progress and recent developments in reverse osmosis membrane technology are described, particularly in regard to the Yuma, Arizona, brackish water desalting plant (96 mgd), the Jedda, Saudi Arabia reverse osmosis seawater desalting plant (3.2 mgd or 12,000 cu m/day), and a high temperature electrodialysis pilot plant of 50,000 gpd capacity designed for seawater desalination being constructed in Israel. Two competing membrane types are the asymmetric cellulose acetate membrane, the first type developed and used today in most existing reverse osmosis plants; and the composite membrane which has become available in the early 1970s. The composite membrane has superior salt rejection capabilities, but is less able to withstand residual chlorine. The new research direction is in finding a chlorine-resistant composite membrane. The Yuma plant will remove about 90% of the salt from brackish water, and the desalted effluent will be blended with untreated drainage water and discharged into the Colorado River. The Jedda plant, the world's largest membrane plant, became operational in 1978 and passed acceptance in 1979. (Mullen-IPA)
W81-04362

A STUDY OF SILICA SCALING IN HIGH RECOVERY REVERSE OSMOSIS SYSTEMS,
Denver Research Inst., CO.
M. Vorum, and R. E. Williams.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-233587, Price codes: A05 in paper copy, A01 in microfiche. Final Technical Report prepared for Office of Water Research and Technology, April, 1979. 92 p, 19 Fig, 17 Tab, 3 Ref, 3 Append. OWRT-C-7520-S(No 6510)(1), 14-34-0001-6510.

Descriptors: *Saline water recovery, *Reverse osmosis, *Silica scaling, *Welton-Mohawk Canal, *Desalting plant, Yuma, Arizona, Colorado River, Calcium content, Sulfate ion concentration, Salt rejection, VOP booster module, Membrane systems, Imperial Dam, Rocky Mountains, Agriculture, Irrigation, Water chemistry, Brackish water, Water quantity, Corrosion, Microscopic organisms, Organic matter.

This project was specifically concerned with the treatment of water from the Wallton-Mohawk irrigation drainage return canal locate in southwestern Arizona. Laboratory and field tests were conducted to ascertain incipient scaling concentration of silica in reverse osmosis systems operating at high recovery levels. Ensuring that other salt scale species would not precipitate out as interferance was a necessary condition. The project involved two related phases of study: corrosion protection, and potential for scale formation. Both stainless steel and some polymeric plastics stood up well against brackish Colorado River water, but the summertime temperatures and strong sunlight at Yuma were a serious problem for certain plastics. Calcium sulfate scale was greatly reduced through pretreatment with lime softening and filtration, and addition of up to 4 ppm of sodium hexametaphosphate (SHMP). When Welton-Mohawk brine was concentrated by evaporation, silica precipitation occurred at 100 ppm silica, which is less than saturation. However, in reverse osmosis tests with up to 90% salt rejection, no silica scaling was observed. Further testing was suggested to effect improvements for the 100-million-gallon per day membrane desalting plant planned for the lower Colorado River outside Yuma, Arizona. (Mullen-IPA)
W81-04367

REVERSE OSMOSIS PLANT HAS MICROPROCESSOR CONTROL,
Public Works, Vol 112, No 3, p 67-69, March, 1981.

Descriptors: *Revese omosis, *Desalination plants, *Computers, Automation, Control systems, Drinking water, Water treatment, Sanibel Island, *Florida, Captiva Island.

A microprocessor programmable controller is used by the reverse osmosis desalination plant which furnishes water to Sanibel and Captiva Islands off Florida's west coast. The plant produces about 0.6 mdg of potable water using an RO train consisting of a cartridge filter, high pressure pump, and two hydrablocks. The plant has an ultimate capacity of 3.63 mdg. The microprocessor includes a central unit and its separate power supply with input/output modules, and two operator interface devices. A number of the variables in the RO plant are best controlled by analog loops. Some functions are handled by on-off logic with counters and timers. The operator controls feedwater and product water pH, concentration-flow to product-water ratio, and each RO module. The number of timers used in the Sanibel operation ranges from 80 to 100, and counters from 20 to 30. Typical applications include start-up and shut-down sequences. A programmer is included for trouble-shooting and communication with the computer memory. (Small-FRC)
W81-04467

HOT BED DESALINATION PROCESS,
J. R. Phillips, and R. N. Jacobson.
US Patent No 4,218,290, 12 p, 5 Fig, 2 Tab, 10 Ref; Official Gazette of the United States Patent Office, Vol 997, No 3, p 984, August 19, 1980.

Descriptors: *Patents *Desalination processes, *Water treatment, *Saline water, Potable water, Flash distillation, Separation techniques, Heat transfer.

Aqueous saline solutions are converted in part to potable water by passing a compressed aqueous saline solution through one or more beds of contained pellets of higher temperature to heat the solution to a flash vaporization temperature. The solution is passed to one or more flash vaporization zones. Vaporized potable water from each vaporization zone is separately passed to contained bed of pellets where water is condensed and pellets heated. Simultaneously, a bed of pelletized solids is heated to supplant the highest temperature bed in the system used for heating. By selective switching of beds, the system is kept in continuous operation with a heated bed of pellets replacing the highest temperature bed previously used to heat the aqueous saline solution. The bed used for water condensation is transferred to the heating cycle for subsequent introduction to the system. (Sinha-OEIS)
W81-04513

IMPROVE RO PRETREATMENT,
D. Comstock.
Water and Wastes Engineering, Vol 17, No 7, p 47-51, July, 1980. 5 Fig, 5 Tab, 3 Ref.

Descriptors: *Reverse osmosis, *Filtration, *Seawater, Chemical coagulation, *Pretreatment of water, Membrane fouling, Water treatment.

Granular media filtration can be effective in the reverse osmosis pretreatment of seawater. Three different seawater pretreatment schemes were evaluated: DE (diatomaceous earth) filtration, granular media filtration preceded by in-line coagulation, and flocculation and settling, followed by filtration. In the first part of the study, mixed-media filters were compared to a single-medium filter when coagulation was accomplished by commercial organic polymers. These tests were disappointing, and plugging factors lower than 51% could not be achieved. The best quality water was procured with mixed-media filters when coagulation was achieved with Nalco 7181 and 8103 polymers. Ferric sulfate dosages needed to produce acceptable quality water were correlated with raw water Silt Density Index values from many filter runs. The mixed-media filters have a tapered void gradation design which utilizes three or more granular materials of different sizes and specific gravities. Removal of solids is spread throughout the filter bed, allowing long high-rate filter runs and producing a superior quality effluent. (Small-FRC)
W81-04629

3C. Use Of Water Of Impaired Quality

IRRIGATION OF SUGARCANE FIELDS WITH SEWAGE EFFLUENTS IN SOUTHERN PUERTO RICO,
Puerto Rico Univ., Mayaguez. Water Resources Research Inst.
N. H. Tang.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-233611, Price codes: A04 in paper copy, A01 in microfiche. Report, June, 1979. 63 p, 11 Fig, 13 Tab, 3 Append. OWRT-A-049-PR(1).

Descriptors: *Irrigation, *Sewage effluents, *Puerto Rico, *Sugarcane, *Water quality, BOD, COD, Nitrates, TDS, Total suspended solids, Saline water, Nitrogen leaching, Soil filtrates, Ocean outfall, Sodium adsorptions ratio, Climatological data, Topsoil, Heavy metal concentration, Soil moisture content, Sugarcane harvest, *Impaired water use.

Primary and secondary sewage effluent and fresh groundwater were used to irrigate sugar cane fields in southern Puerto Rico. Because of a shortage of surface and groundwater, irrigation water production in this region is low and new sources of water are being urgently sought; it is estimated that production could be doubled if sufficient additional irrigation were available. Two sources of additional water used were the Ponce primary treatment plant effluent (10 mgd), and the Fort Allen secondary treatment plant effluent. Ponce primary effluent was found to be generally good for sugarcane irrigation, comparing favorably with groundwater. Fort Allen secondary effluent was not suitable because of high salt content. Plots using sewage effluent were tested to determine their chemical state before and at the end of the study. Although soil organic content increased somewhat during the course of the study, the amount of increase appeared insignificant. COD values of filtrates at depths of 3 ft and 5 ft showed little difference among the three types of water used. Nitrate in sewage effluents did not increase the potential of nitrogen leaching into the groundwater. The field irrigated with Ponce primary sewage effluent yields a cane production of 3.77 lb/sq ft, with sugar content of 9.24%. (Mullen-IPA)
W81-04364

WATER QUALITY CHANGES AND CLEARING REQUIREMENTS FOR IMPOUNDMENTS IN ARCTIC AND SUBARCTIC REGIONS,
Alberta Univ. Edmonton. Dept of Civil Engineering.
D. W. Smith.
Water Science and Technology, Vol 13, No 1, p Tor 713-733, 1981. 11 Fig, 3 Tab, 25 Ref.

Descriptors: *Water quality, *Polar regions, Water quality control, Seasonal variations, Climatic zones, Arctic zone, Quality control, Water quality data, *Impoundments, Iron, Cold regions, Color removal, Available water, Water use, *Baseline studies, *Preimpoundment.

The natural quality of surface water in the tundra regions of Alaska, the observed effects of an impoundment on quality and an examination of the importance of clearing on water quality are the factors examined in this study. In the existing water significant iron and color remained, and much concern was expressed for its removal during reservoir clearing efforts. Many non-impounded surface water would require treatment before domestic use would be possible. The quality of natural winter water was further decreased as a result of the removal, by the freezing process, of relatively pure water from the available supply. Soil samples were taken from five different sites and tested for leaching. In each case the soils severely deteriorated water quality. A procedure is presented for aiding in making decisions regarding the clearing requirements for a particular impoundment site. The major component of this procedure was to obtain knowledge of the effect of each soil horizon on the impounded water during the winter seasons. The leaching tests described offer a significant amount of data pertinent to this component of the decision making process. (Baker-FRC)
W81-04429

WATER RESERVOIR,
For primary bibliographic entry see Field 5D.
W81-04530

THE WINNIPEG EXPERIENCE,
Metropolitan Corp. of Greater Winnipeg (Manitoba). Water Works and Waste Disposal Div.
C. Tottle.
Water and Pollution Control, Vol 118, No 1, p 9, 12-13, 29-30, January, 1980.

Descriptors: *Artificial lakes, *Storm runoff, Storm waste water, Storm water, Urban runoff, Water quality, Bacteria, Algae, *Impaired water use.

Several areas were investigated under a grant to monitor the usefulness of impoundments for stormwater management. Such a system had been developed 10 years earlier in the Southdale area of Winnipeg. For the most part, water quality of the collected water was good. While it would not be recommended for use as untreated water supplies, for the purposes of sailing, paddling, and surfing, making fountains, picnicking and occasional swimming, it was clearly adequate. The in-system water quality satisfied primary contact recreational standards. Under severe inflow conditions, the fecal bacteria levels are sensitive to shock loads, but there is also a quick die-off. Salmonella was not found. Dissolved oxygen levels were constantly changing, and at mid-depth the summer DO levels always exceeded 5 ppm. Naturally occurring bullhead minnows were noted in the majority of Winnipeg's 30-plus lakes; these are ravenous consumers of mosquito larvae. Control of both algae and weed growth problems has been attained with applications of simazine, a herbicide, from once to several times a season. Costs for algae and weed control run about $7 per acre of drainage area. Maintenance of grass on public portions of shoreline costs about $18 per acre. Urban runoff has not yet been a problem, but there is some concern that it may become a problem in the future. (Baker-FRC)
W81-04608

THE SWEET SMELL OF SUCCESS,
Water and Pollution Control, Vol 118, No 4, p 22, April, 1980.

Descriptors: *Sludge, *Land disposal, Agriculture, Crops, Farming, *Waste water farming, *Canada.

Soil conditioning and fertilizing qualities of sludge have been examined in the City of Edmonton, Canada. Sludge has a high humus content which imparts favorable characteristics to the soil. It is rich in nutrients such as potassium, ammonium nitrogen, organic nitrogen, phosphorus, copper, zinc, iron and manganese needed for plant growth. Sludge treated land has provided a much better quality and quantity of product. Money has been saved from not having to purchase expensive land for sewage lagoon systems. The farmer also benefits, as does the local community. (Baker-FRC)
W81-04628

LAND TREATMENT OF WASTEWATER,
For primary bibliographic entry see Field 5D.
W81-04649

3D. Conservation In Domestic and Municipal Use

EFFECTS OF WATER CONSERVATION INDUCED WASTE WATER FLOW REDUCTION, A PERSPECTIVE,
California State Dept. of Water Resources, Sacramento.
J. S. Koyasako.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-113425, Price codes: A08 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-80-137, August, 1980. 171 p, 23 Fig, 54 Tab, 24 Ref, 3 Append.

Descriptors: *Water conservation, *Domestic water, *Waste water treatment, *Cost analysis, Cost-benefit analysis, Waste water facilities, California, Drought, Water supply, Domestic wastes.

When water conservation measures were undertaken during the California drought of 1976-77, it was anticipated that water and energy would be saved, but little was known about the effects of waste water flow reduction on the operation and maintenance of the waste water systems. One-half of 17 waste water systems surveyed encountered operational problems during periods of flow reductions. In general, the problems were not severe enough to greatly affect the systems operations. The BOD and suspended solids concentrations of the waste water entering the treatment plant generally increased while the concentrations leaving the plant generally decreased during years of flow reduction. The overall operating and maintenance costs for the waste water collection system decreased slightly. The decrease in energy use for the treatment plants amounted to a maximum of 20% at 50% reduction in flow due to lower pumping requirements. Use of chemicals ranged from a decrease of 30% to an increase of 50%. The primary economic benefits and costs of water conservation to a hypothetical community which characterizes average statewide conditions in California are quantified, using the period 1980-2000 as the basis for analysis. Indoor water use reduction for the water conservation measures examined range from 10% to 40%. The major benefits are energy savings due to less use of hot water and cost savings in sewer systems. Other benefits are cost savings in water supply and waste water treatment plants. (Moore-SRC)
W81-04389

3E. Conservation In Industry

INDUSTRIAL REUSE AND RECYCLE OF WASTE WATERS; LITERATURE REVIEW,
Robert S. Kerr Environmental Research Lab., Ada, OK. Source Management Branch.
J. E. Matthews.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-155145, Price codes: A10 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-80-183, December, 1980. 212 p, 912 Ref.

Descriptors: *Water reuse, *Waste water renovation, *Recycling, *Industrial waste water, *Literature review, Economic aspects, Industrial water, Tannery wastes, Metal-finishing wastes, Textiles, Food-processing wastes, Chemical wastes, Oil wastes, Pulp and paper industry.

The Federal Water Pollution Control Act Amendments of 1972 require industry to achieve the goal of zero discharge by 1985. In order for industry to reach this goal, recycling and reuse of treated waste waters will be necessary. A review of the literature on reuse/recycle of waste waters by industry is presented for the period 1967-1978. An attempt was made to include the most prominent references for nine different industrial categories: food processing; textile and synthetic products; leather tanning; petroleum refining; organic chemicals; inorganic chemicals; iron and steel; metal plating and finishing; and pulp and paper, and allied industries. Sections are included on industrial use of municipal waste water, reclamation processes, and economics of water reuse/recycle. The feasibility of successful reuse involves matching the quality of renovated water with water quality requirements of each category of water use. A successful match eliminates water pollution and is equivalent to developing a new water supply. In almost every industry recycle or reuse of water must be accomodated in the future for both economics and conservation. While reuse possibilities are numerous and easy to propose, each reuse case is different to some extent. In all cases, the decision on what water can be recycled is not casual but must be based on careful evaluation of process requirements. (Moors-SRC)
W81-04388

WATER ALKALINITY CONTROL IN THE MANUFACTURE OF HYDROUS SILICATE PRODUCTS,
Owens-Corning Fiberglas Corp., Toledo, OH. (Assignee).
For primary bibliographic entry see Field 5D.
W81-04531

3F. Conservation In Agriculture

RESISTANCE TO WATER FLOW IN THE INTRA-COLEOPTILE INTERNODE OF WHEAT,
Agricultural Research Inst., Wagga Wagga (Australia). Dept. of Agriculture.
For primary bibliographic entry see Field 2I.
W81-04451

EFFECT OF WATER TABLE DEPTH AND TILLAGE METHODS ON PLANT-WATER STATUS AND YIELD OF RICE,
International Inst. of Tropical Agriculture, Ibadan (Nigeria).
P. R. Maurya, and R. Lal.
Plant and Soil, Vol 59, p 17-22, 1981. 2 Fig, 1 Tab, 9 Ref.

Descriptors: *Agricultural hydrology, *Water table fluctuations, *Soil moisture deficiency, Crop production, Rice, Soil water table, Water table, Transpiration, Leaves, Root development, Lysimeters.

The effects of water table depths on plant water status and grain yield of two varieties of rice (TOS78 and TOS848) were investigated in two soils in lysimetric laboratory tests. The effects of fluctuating water table levels on the growth of rice plants in a hydromorphic soil were also examined in field tests. The leaf water potential of TOS78 measured at 1300 hours at the 50% flowering stage was 17.5 bars for a water table depth of 0 cm, and 23.0 bars for a water table depth of 60 cm. TOS848 possessed a higher leaf-water potential and afforded a greater yield than TOS78 when grown under soil moisture stress conditions. In the lysimetric investigations, leaf water potential of both varieties was lower on a sandy Apomu than in a clayey Egbeda soil. Under hydromorphic soil conditions, untilled soils yielded the same amounts of rice as conventionally tilled plots. (Geiger-FRC)
W81-04452

THE INFLUENCE OF WATER STRESS ON THE PHOTOSYNTHETIC PERFORMANCE AND STOMATAL BEHAVIOUR OF TREE SEEDLINGS SUBJECTED TO VARIATION IN TEMPERATURE AND IRRADIANCE,
Lancaster Univ., Bailrigg (England). Dept. of Biological Sciences.
O. Osonubi, and W. J Davies.
Oecologia, Vol 45, No 1, p 3-10, 1980. 11 Fig, 34

Ref.

Descriptors: *Photosynthesis, *Water stress, *Trees, Stomatal transpiration, Temperature, Transpiration, Irradiation, Birch trees, Stress, Drought, Agricultural hydrology, Forestry.

Seedlings of two important woody species, Gmelina arborea L. and Betula pendula Roth (silver birch), were subjected to fluctuations in irradiation and temperature and to a mild water-stressing treatment. For both species, the relationships of phtosynthesis to temperature and irradiance were similar to those reported for other species. Water stress reduced the rate of photosynthesis, especially at high temperatures. This was attributed to a decrease in mesophyll conductance under these conditions. The optimum temperature for stomatal opening was significantly lower than that for photosynthesis, which was in turn lowered by the water stress treatment. Birch seedling stomata showed a maximum opening at an intermediate, while Gmelina stomata usually displayed a closing movement when leaf temperatures rose above 15 degrees. The mesophyll conductances of both species increased with increasing temperature. Physiological components responsible for the observed variations in photosynthetic and stomatal behavior are examined along with th ecological implications of these variations. (Geiger-FRC)
W81-04465

VEGETATION SPRINKLER HAVING A HAND ADJUSTMENT TO DIRECT THE SPRAY,
Champion Brass Mfg. Co., Los Angeles, CA. (Assignee).
M. Citron.
U.S. Patent No 4,220,283, 10 p, 16 Fig, 4 Ref; Official Gazette of the United States Patent Office, Vol 998, No 1, p 143, September 2, 1980.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Application equipment, Irrigation efficiency, Irrigation practices, Irrigation operation and maintenance.

A pop-up riser in a vegetation sprinkler in which the riser is forced out of a housing by water pressure has a nozzle at its upper end. The riser is normally held in a retracted position by a coil spring. A serrated ring is fixed either on the housing or riser and reslient tabs extending respectively from the other are engaged with the serrations. Precise spray direction is achieved by relative rotation between the tabs and serrations. The nozzle configuration has an outwardly directed flow passage having a portion of its wall cutaway and has its upper end terminating in a conical wall to achieve an optimum spray pattern. A seal is fitted in the housing so as to surround the riser and so as to engage the riser as it is moved upwardly to extended sprinkling positions. (Sinha-OEIS)
W81-04532

OSCILLATING WATER SPRINKLER,
Burgess Vibrocrafters, Inc., Grayslake, IL. (Assignee).
J. L. Beiswenger, F. A. Smiesko, and D. V. Chaphalkar.
U.S. Patent No 4,220,284, 11 p, 16 Fig, 5 Ref; Official Gazette of the United States Patent Office, Vol 998, No 1, p 143, September 2, 1980.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Application equipment, Irrigation efficiency, Irrigation practices.

A snap-action toggle valve reverses the direction of an ocillating sprinkler powered by a paddle-piston motor. Adjustable stops on the sprinkler tube trip the valve at the end of each sweep, alternately opening left and right motor chamber channels interconnected to a sprinkler supply channel feeding the sprinkler tube without interruption. A special vane on the sprinkler tube where it intercepts the sprinkler supply channel prevents vortex action. The edges of the paddle-piston are sealed to the motor chamber by a flanged slip-on wiper. (Sinha-OEIS)
W81-04533

GENETIC AND SOIL MOISTURE EFFECTS ON THE BRANCHING-ROOT TRAIT IN ALFALFA,
Illinois Univ. at Urbana-Champaign. Dept. of Agronomy.
For primary bibliographic entry see Field 2I.
W81-04572

DROUGHT RESPONSE OF WINTER WHEAT CULTIVARS GROWN UNDER FIELD STRESS CONDITIONS,
South Dakota State Univ., Brookings. Dept. of Plant Science.
For primary bibliographic entry see Field 2I.
W81-04573

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

THE CHEMICAL CONTROL OF THE WATER HYACINTH (EICHHORNIA CRASSIPES (MART.) SOLMS),
National Inst. for Water Research, Pretoria (South Africa).
P. J. Ashton, W. E. Scott, and D. J. Steyn.
Water Science and Technology, Vol 13, No 2, p Tor 865-882, 1981. 8 Fig, 5 Tab, 35 Ref.

Descriptors: *Water hyacinth, *Aquatic weed control, *Herbicides, Water quality, Pesticides, Terbutryn, Eutrophication, Eichhornia crassipes (Mart.), Potassium, Nitrogen, Sodium, Phosphorus, Nutrients, Reservoirs, *Hartbeespoort Dam, South Africa.

Chemical control of an infestation of Eichhornia crassipes (Mart.) Solms on the Hartbeespoort Dam in South Africa was attempted by using a terbutryn herbicide, Clarosan 500 FW. Herbicidal action was slow and the foliar symptoms were typical of plants having been treated with triazine derivatives. Over a period of 405 weeks the plants died, decomposed and sank into the water, causing a gradual depletion of oxygen in the water. An increase in the levels of potassium, sodium, nitrogen and phosphorus levels was noted in the impoundment, particularly in the surface water samples taken. Plants that had not been sprayed exhibited high growth rates, necessitating effective follow-up action. Only low levels of herbicide residues were found in the water samples. Fish viscera demonstrated some temporary accumulation. (Baker-FRC)
W81-04437

CONTAINER FOR RELEASING DRY CHEMICAL IN A BODY OF WATER,
Clarke Outdoor Spraying Co., Inc., Roselle, IL. (Assignee).
For primary bibliographic entry see Field 5G.
W81-04521

NEW PROBLEMS WITH UPLAND WATERS,
R. E. Youngman, and T. Lack.
Water Services, Vol 85, No 1019, p 13-14, January, 1981. 9 Ref.

Descriptors: *Water quality control, *Agricultural runoff, *Reforestation, *Land use, *Great Britain, Planning, Eutrophication, Farm wastes, Catchment areas, Watersheds, Pastures, Nutrients, Phosphates, Nitrates, Fertilizers, Water treatment, Erosion.

The western uplands of Great Britain supply water to most of the country via aqueducts or pipelines. Some problems facing this catchment area and its water supplies are briefly reviewed. As the forestry industry and demands for pasture lands grow, erosion and runoff from phosphate and nitrate fertilizers are expected to increase. The increased levels of phosphate in upland reservoirs may result in a need for additional processing by water treatment facilities. Afforestation of the catchment areas will cause a loss of yield due to the greater evaporation of water from trees than from grasses. Further research into the effects of land use changes of this area in relation to the costs of water treatment and water quality monitoring will be necessary. Studies are also being conducted on the response of water bodies to increased nutrient loading. (Geiger-FRC)
W81-04602

4B. Groundwater Management

ANALYSIS OF THE DEVELOPMENT OF SHALLOW GROUNDWATER SUPPLIES BY *PUMPING FROM PONDS,*
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
M. M. Aral, T. W. Sturm, and J. M. Fulford.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-231904, Price codes: A06 in paper copy, A01 in microfiche. Environmental Resources Center, Georgia Institute of Technology. Technical Completion Report ERC-02-81, February, 1981. 100 p 22 Fig, 1 Tab, 25 Ref. OWRT-A-089-GA(1).

Descriptors: *Groundwater, Aquifer systems, Artesian flow, *Numerical analysis, *Piezometric head, *Recharge wells, Coastal plain, Axisymetric flow pattern, Water table, Combined aquifer transmissivitiy, Storage coefficient, Saline water, Fresh water zones, Artesian aquifer, Connector wells, Well hydraulics, Surface aquifer, Irrigation pit, Permeability, Popodopolos-Cooper solution, Groundwater seepage, Georgia, Brunswick area.

Continued pumping from the principal artesian aquifer in coastal Georgia has led to a general decline of the piezometric in the Brunswick area. As the groundwater level has declined, saline has intruded into freshwater zones. Since coastal Georgia depends heavily on this groundwater resource, its loss would be a severe problem. A shallow, unconfirmed aquifer overlays the artesian aquifer receives surface recharge. Two uses for this shallow aquifer have been proposed: (1) recharging the artesian aquifer through connector wells; (2) using the shallow as a direct water source through development of large diameter, shallow wells or ponds. This study explores the second alternative through use of a numerical model to study the hydraulics of flow to a pond in an unconfined aquifer. The groundwater hydraulics problem is solved by the finite element method for two-dimensional pits and axisymmetric ponds in phreatic aquifers for steady-state and transient cases. (Mullen-IPA)
W81-04311

FIVE-YEAR HAWAII WATER RESEARCH AGENDA, 1982-1987,
Hawaii Univ., Honolulu. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-231912, Price codes: A05 in paper copy, A01 in microfiche. Report, October, 1980. 89 p 13 Fig, 10 Tab, 47 Ref.

Descriptors: *Research priorities, *Hawaii, *Groundwater, *Aquifer management, *Water allocation, *Water quality management, Water use, Water treatment, Rainfall, Evapotranspiration, Freshwater laws, Dike storage, Perched aquifer, Spring discharge, High-level water source, Recreation, Municipal supply, Aquaculture, Agriculture, Freshwater withdrawal, Water management, Overdraft.

Four major problem areas facing water resources planners, operating agencies, and the general public are addressed. The most pressing problem in Hawaii is water supply, especially the near overdraft conditions of the basal groundwater aquifers. Next is the problem of water quality, especially in the coastal areas. Third is the problem of identifying proper value for instream uses, such as recreation and aesthetics, and flora and fauna habitat. Fourth, the legislature has a constitutional mandate to write new laws and to establish new agencies to

deal with water allocation; the legal and institutional reforms will affect the water resource situation for many years. Available water resources are surveyed as well as the principal water using activities. State water problems are presented with an agenda for research with associated budget requirements. (Mullen-IPA)
W81-04313

A HYDROLOGIC CARBONATE CHEMISTRY MODEL OF FLOODED RICE FIELDS,
Arkansas Water Resources Research Center, Fayetteville.
J. A. Ferguson, and J. T. Gilmour.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-231953, Price codes: A03 in paper copy, A01 in microfiche. Publication No 78, 1981. 30 p, 8 Fig, 5 Tab, 2 Append. OWRT-A-040-ARK(1).

Descriptors: *Groundwater, Hydrology, *Precipitation, *Deposition, *Computer model, *Water management, Carbonate chemistry, Flooded rice fields, Subterranean waters, Calcium carbonate accumulation, Zinc deficiency, Soil pH, Precipitation reaction, Floodwater hydrology, Localized accumulations, Julian days, Flow rate, Irrigation system, Percolation rate, Climatologic array, Water balance, Flowtime, Evapotranspiration, Seepage, Transient volume, Equilibrium calcium concentration, *Arkansas.

Groundwater used to irrigate flooded rice fields in Arkansas is often saturated or supersaturated with calcium carbonate which precipitates out onto the rice bed. Soil pH rises and zinc deficiency occurs in the rice seedlings. Zinc fertilizers provide a short term solution, but a water management plan is needed to slow, stop or reverse the localized accumulation of calcium carbonate and concomitant soil pH increase. As water pumped onto a rice field warms, carbon dioxide diffuses from the water, precipitating out insoluble calcium carbonate. Calcium and bicarbonate concentrations came into equilibrium with the calcium carbonate precipitate. Because water is flooding in during this reaction process, precipitation kinetics cannot define spatial or temporal distribution of the precipitate; irrigation water hydrology is superimposed on the chemical reaction kinetics. This study was undertaken to devise a computer model which would interface floodwater hydrology with precipitation kinetics to describe the distribution of calcium carbonate precipitate in a flooded rice field, and to evaluate water management alternatives. Field verification of the model was performed in three production fields in Prairie and Arkansas Counties, Arkansas. (Mullen-IPA)
W81-04317

GEOHYDROLOGY AND MODEL ANALYSIS FOR WATER-SUPPLY MANAGEMENT IN A SMALL AREA OF WEST-CENTRAL KANSAS,
Geological Survey, Lawrence, KS. Water Resources Div.
L. E. Dunlap, J. Kume, and J. G. Thomas.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-188013, Price codes: A04 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 80-91, October, 1980. 59 p, 25 Fig, 25 Ref.

Descriptors: *Geohydrology, *Model studies, *Groundwater, Aquifer characteristics, Water management, Projections, Aquifers, Water storage, Natural recharge, Irrigation wells, Pumping, *West-central Kansas, *Ogallala aquifer, Water-level declines.

The saturated thickness of the Ogallala aquifer in an intensive-study area (12-square miles in northeastern Wichita County) has decreased substantially since the development of irrigation. Water levels have declined 1.08 to 2.22 feet per year during 1950-78. In 1977, saturated thickness in the area ranged from 40 to 80 feet, aquifer storage was about 61,000 acre-feet, and natural recharge was estimated to be 0.28 inches per year. During 1977-78, irrigation wells pumped 7,400 acre-feet per year and water-level declines ranged from 0.91 to 5.05 feet. A groundwater flow model was used to project the changes in water level from 1978 to 1988 in the intensive-study area if pumpage in the model area was (1) one-half, (2) equal to, or (3) double the 1977 rate. Water-level declines would range from 5 to 15 feet, 15 to 30 feet, and 25 to 40 feet, respectively. If pumpage in the intensive study area is changed to one-half or double the 1977 rate, water-level declines would range from 10 to 20 feet or 20 to 25 feet, respectively. (USGS)
W81-04339

ESTIMATED AGRICULTURAL GROUNDWATER PUMPAGE IN PARTS OF THE SAN JOAQUIN VALLEY, CALIFORNIA, 1975-77,
Geological Survey, Menlo Park, CA. Water Resources Div.
H. T. Mitten.
Available from the OFSS, USGS, Box 25425, Denver Fed. Ctr., Denver, CO 80225, paper copy $1.75, microfiche $3.50. Geological Survey Open-File Report 80-1281, December, 1980. 11 p, 1 Fig, 1 Tab, 7 Ref.

Descriptors: *Groundwater, *Pumping, *Water use, *Irrigation, Withdrawal, Estimating, Electric power, *California, *San Joaquin Valley, Groundwater pumpage.

The report lists agricultural groundwater pumpage for 1975-77 in parts of Merced, Madera, Fresno, Kings, Tulare, and Kern Counties, San Joaquin Valley, Calif. The method of estimating pumpage was based on electric-power consumption at the agricultural wells. (USGS)
W81-04356

4C. Effects On Water Of Man's Non-Water Activities

THE EFFECTS OF HIGHWAY CONSTRUCTION ON SEDIMENT DISCHARGE INTO BLOCKHOUSE CREEK AND STEAM VALLEY RUN, PENNSYLVANIA,
Geological Survey, Williamsport, PA. Water Resources Div.
R. A. Hainly.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-202202, Price codes: A04 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 80-68, November, 1980. 50 p, 29 Fig, 3 Tab, 26 Ref.

Descriptors: *Sediment discharge, *Sediment control, *Road construction, *Watersheds, Streamflow, Diversion, Data collections, Rainfall, Suspended sediments, Suspended lod, Sediment yield, Erosion control, *Pennsylvania, Blockhouse Creek, Steam Valley Run.

From October 1972 through September 1977, the effects of highway construction in the 38 square mile Blockhouse Creek basin were studied. Water discharge, suspended-sediment discharge, and stream-temperature data were collected at four stations in the basin. The 5-year period included 1 year before construction, 2 years during construction, and 2 years after construction. The effects of stream relocation and sediment-control methods used in the highway construction were also investigated. During the period of data collection, about 35,500 tons of suspended sediment was transported by Blockhouse Creek and Steam Valley Run. The data indicate that 9,100 tons was introduced to the stream from construction areas. The normal sediment yield for the two basins was determined to be 80 tons per square mile per year. Most of the sediment was transported by the streams during high flows and probably passed through Blockhouse Creek, as little deposition was observed below the construction area. Stream temperature seemed to be relatively unaffected by the stream relocations and diversions. Stream relocation and diversion methods were successful in limiting the amount of sediment discharged by the new channels. Physical sediment-control methods limited sediment discharge during baseflow periods and small storms. Coarse sediments especially were controlled by these methods. The most effective method of sediment control was limiting the amount of time that the construction-area soils were exposed. (USGS)
W81-04324

POROUS PAVEMENT; PHASE I - DESIGN AND OPERATIONAL CRITERIA,
Espey, Huston, and Associates, Inc., Albuquerque, NM.
E. V. Diniz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-104796, Price codes: A05 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-80-135, August, 1980. 99 p, 5 Fig, 10 Tab, 20 Ref, 2 Append.

Descriptors: *Paving, *Porous pavement, *Urban runoff, *Water quality, *Asphalt, Percolation, Infiltration, Storm runoff, Soil properties, Design criteria, Flood control, Groundwater recharge, Cost analysis, Computer models.

The factors which influence runoff and water quality from areas using various porous pavement designs were investigated, with particular emphasis on porous asphalt pavement. Porous asphalt pavement consists of a relatively thin course of open graded asphalt mix over a deep base of large size crushed stone aggregate. Water passes through to the gravel base and underlying ground. Water is stored in the gravel base until it percolates into the subbase or is drained through lateral drainage systems. The velocity reductions and infiltration will result in suspended particulate removal, some chemical pollution reduction and have been shown to reduce concentrations of nutrients and heavy metals. The use of porous pavement is presently limited to parking lots. The design considerations for its use include site problems based on existing soil properties, load bearing design, and hydrologic design of pavement and subbase. A computer moel for hydrologic performance evaluation of existing or proposed porous systems is available. Specific design and operational criteria are presented, with a set of sample specifications. The advantages of using porous pavements include: reduction of peak runoff to storm sewers, storm water pollution and flooding, and erosion; improvements in wet pavement skid resistance; and cost reductions resulting from the elimination of curbs, drains, and storm sewers, and less grading and landscaping of the site. (Brambley-SRC)
W81-04377

THE STIMULATION OF AUTOTROPHIC PRODUTION BY URBAN STORMWATER-BORNE NUTRIENTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
T. J. Grizzard, R. N. Waterman, C. W. Randall, and R. C. Hoehn.
Water Science and Technology, Vol 13, No 2, p Tor 883-896, 1981. 4 Fig, 6 Tab, 18 Ref.

Descriptors: *Storm water, *Nutrients, Urban runoff, Urban drainage, Trophic level, Lead, Zinc, Phosphorus, Nitrogen, Algal growth.

Research was conducted to investigate the algal availability of stormwater-borne nutrients in an area where previous studies have shown urban runoff to be responsible for the major portion of the annual nutrient loads entering a system of eutrophic receiving waters. Thirteen small catchment basins, representing six urban land uses ranging from low density residential to central business district, were selected for study. Phosphorus and nitrogen concentrations and availability in the composite stormwater runoff samples were sufficiently high to support moderate to high levels of production of the test alga, Selenastrum capricornutum. Lead and zinc concentrations in stormwater from certain urban land uses were inhibitory to algal production. The annual average biomass supported by urban stormwater genrally bore a positive relationship to density of development. (Baker-FRC)
W81-04438

4D. Watershed Protection

THE EFFECTS OF HIGHWAY CONSTRUCTION ON SEDIMENT DISCHARGE INTO BLOCKHOUSE CREEK AND STEAM VALLEY RUN, PENNSYLVANIA,
Geological Survey, Williamsport, PA. Water Resources Div.
For primary bibliographic entry see Field 4C.
W81-04324

POROUS PAVEMENT; PHASE I - DESIGN AND OPERATIONAL CRITERIA,
Espey, Huston, and Associates, Inc., Albuquerque, NM.
For primary bibliographic entry see Field 4C.
W81-04377

SOIL EROSION EFFECTS ON SOIL PRODUCTIVITY: A RESEARCH PERSPECTIVE.
Science and Education Administration, Temple, TX.
Journal of Soil and Water Conservation, Vol 36, No 2, p 82-90, March/April, 1981. 119 Ref.

Descriptors: *Soil erosion, *Crop yield, *Research priorities, *Erosion control, Agriculture, Crop production.

Accurate estimates of soil productivity are essential in agricultural planning and decision making. The relationship between soil productivity and erosion must be defined before management strategies can be selected which will maximize long-term crop production. A few field experiments have demonstrated that erosion can drastically reduce crop yields, but this research was performed in a small area of the total US, so climatic variability was not investigated. Modeling research is also limited, and empirical relationships have been difficult to develop because data are limited and improved technology has masked some of erosion's effects. No physical models have been developed specifically for studying the effect of erosion on productivity. Additional research is needed to permit the prediction of accumulated erosion, annual crop yields, nutrient losses, annual fertilizer application rates, offsite sediment deposition, downstream nutrient yields to streams and lakes, and energy requirements for tillage and maintenance. With this information, accumulated erosion could be mathematically related to crop yield. (Small-FRC)
W81-04599

5. WATER QUALITY MANAGEMENT AND PROTECTION

THE ROLE OF FILAMENTOUS MICROORGANISMS IN ACTIVATED SLUDGE SETTLING,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
M. Sezgin.
Progress in Water Technology, Vol 12, No 6, p Tor 97-106 1980. 4 Fig, 2 Tab, 10 Ref.

Descriptors: *Activated sludge, *Microorganisms, *Sedimentation, Suspended solids, Sedimentation rates, Bacterial physiology, Waste water treatment.

Activated sludge from two laboratory units and twelve sewage treatment plants were studied to determine a relationship between the quantity of filamentous microorganisms in the sludge an its settling characteristics. For a suspended solids concentration range of 700-4800 mg/liter, activated sludge settling characteristics represented by reflocculation time, zone settling velocity, and height of the compact volume after 60 min settling were related to the length of filamentous microorganisms present. At high filament length concentrations, zone settlng velocity reached a maximum value and then decreased with increasing suspended solids concentration. At low suspended solids concentrations, the settling was mainly influenced by interparticle forces exerted by filamentous microorganisms. Increases in suspended solids concentration increase the importance of gravitational forces and decrease zone settling velocity primarily due to interparticle force created by flocs. (Small-FRC)
W81-04406

5A. Identification Of Pollutants

RAPID AND PRECISE DETERMINATION OF ATP USING A MODIFIED PHOTOMETER,
Geological Survey, NSTL Station, MS. Water Resources Div.
D. J. Shultz,, and D. W. Stephens.
Available from the OFSS, USGS, Box 25425, Fed. Ctr., Denver, CO 80225, paper copy $1.50, microfiche $3.50. Geological Survey Open-File Report 80-1194, 1980. 10 p, 2 Fig, 2 Tab, 7 Ref.

Descriptors: *Photometry, *Adenosine triphosphate, Biomass, Enzymes, Sampling, Contamination, *Aminco Chew-Glow photometer, *Disposable tip pipette.

An inexpensive delay timer was designed to modify a commercially available ATP photometer which allows a disposable tip pipette to be used for injecting either enzyme or sample into the reaction cuvette. The disposable tip pipette is as precise and accurate as a fixed-needle syringe but eliminates the problem of sample contamination and decreases analytical time. (USGS)
W81-04349

DETERMINATION OF TRIVALENT CHROMIUM IN SEAWATER BY CHEMILUMINESCENCE,
Maine Univ. at Orono. Dept. of Chemistry.
C. A. Chang, H. H. Patterson, L. M. Mayer, and D. E. Bause.
Analytical Chemistry, Vol 52, p 1264-1267, 1980. 3 Fig, 16 Ref. OWRT-B-016-ME(5).

Descriptors: *Chemiluminescence, *Metal speciation, *Maine, *Chromium concentration, *Detection limit, Magnesium ions, Fluorescence spectrometer, Aquated chromium, Seawater analysis, Metal ion interference, Halide enhancement, Chelating reagents.

Chromium speciation and concentration in Maine aquatic and marine systems into which chromium (III-rich effluents from tanneries are discharged were studied using the luminal chemiluminescence (CL) technique. Use of luminol peroxide made possible chromium speciation in seawater; previous techniques have only been accurate in freshwater systems. Trace aquated chromium (III) ions catalyzed luminol oxidation by peroxide with the emission of blue light; light intensity was proportional to the quantity of chromium (III) present in the sample. Normal detection, and hence low reading of trivalent chromium occurred in ordinary seawater because of interference by magnesium and calcium ions. Because bromide ions enhance the chemiluminescence reaction, lowering the detection limit in freshwater to the parts per-trillion range, a 0.5-M bromide preparation was used in 35% saline seawater to reach a final detection limit of 0.2 parts per billion. (Mullen-IPA)
W81-04361

EVALUATION OF ACID-FAST BACTERIA, CANDIDA ALBICANS, ENTERIC VIRUSES AND CONVENTIONAL INDICATORS FOR MONITORING WASTE WATER RECLAMATION SYSTEMS,
National Inst. for Water Research, Pretoria (South Africa).
W. O. K. Grabow, J. S. Burger, and E. M. Nupen.
Water Science and Technology, Vol 13, No 2, p Tor 803-817, 1981. 1 Fig, 4 Tab, 37 Ref.

Descriptors: *Waste water renovation, *Water quality, *Bioindicators, Indicators, *Bacteria, Water reuse, Coliforms, Microorganisms, Viruses, Fungi, Candida albicans, Pollutant identification.

A study was made of the removal of microorganisms from a 4000 cubic meter/day modified experimental waste water reclamation plant. Initial high lime treatment and intermediate chlorination was replaced by ferric chloride clarification and ozonation respectively. Microorganisms were significantly reduced in number after the changes were made. Enteric viruses were removed effectively after clarification; no enteric viruses were detected in more than 11,000 liters of reclaimed water analyzed by ultrafiltration. Acid-fast bacteria were resistant to most treatment processes, and their absence after chlorination confirmed the inactivation of vegetative bacteria and viruses. Candida albicans was removed after clarification and displayed no indicator value. A total plate count of less than 100 per ml and the absence of acid-fast bacteria, P. aeruginosa, total coliforms and coliphages from 100 ml of the final water, and preferably two intermediate stages, is a feasible analytical limit, offering a wide safety margin for routine monitoring of established waste water reclamation systems. (Baker-FRC)
W81-04434

STUDY OF A POUR PLATE TECHNIQUE FOR THE ENUMERATION OF COLIFORM ORGANISMS IN SURFACE WATER,
Institut Pasteur de Lyon (France).
J. Vial, and Ch. Geoffray.
Water Science and Technology, Vol 13, No 2, p Tor 837-849, 1981. 11 Tab, 7 Ref.

Descriptors: *Coliforms, *Surface waters, *Bacterial analysis, Bacteria, Water quality, Sanitation, Water quality standards, Pour plate technique, *Pollutant identification.

Counting techniques were investigated in order to determine coliform densities of surface water. The most usual technique of enumeration, the multiple tube technique, gives a most probable number of coliforms with confidence limits too wide to prevent disputes on the interpretation of results. Counts of colonies on solid medium are more precise, and membrane filtration techniques are often used. However, many false results occur in polluted waters. By comparing these techniques it was concluded that a pour plate technique with a judiciously chosen medium should allow more precise results to be obtained than other techniques in routine coliform enumeration of most surface waters. When coliform density is lower than about 500 organisms per 100 ml, membrane filter techniques should be used to supplement pour plate techniques. (Baker-FRC)
W81-04435

EFFICIENCY OF ULTRAFILTRATION FOR THE ISOLATION OF ENTERIC VIRUSES AND COLIPHAGES FROM LARGE VOLUMES OF WATER IN STUDIES ON WASTE WATER RECLAMATION,
National Inst. for Water Research, Pectoria (South Africa).
E. M. Nupen, N. C. Basson, and W. O. K. Grabow.
Water Science and Technology, Vol 13, No 2, p Tor 851-863, 1981. 3 Tab, 45 Ref.

Descriptors: *Ultrafiltration, *Viruses, *Reclaimed water, Enteric viruses, Waste water renovation, Bacteria, Water reuse, Coliphage, Separation techniques.

The efficiency of a pressure ultrafiltration procedure using flat membranes was investigated for the recovery of enteric viruses, the SA 11 simian rotavirus and coliphages from up to 100-liter seeded samples of distilled water, conventional tap water and reclaimed water. The efficiency of coliphage recovery from activated sludge effluent and samples representing different levels of purificaton in a multiple-barrier waste water reclamatin plant was also evaluated. The average recovery efficiency of Escherichia coli K12 Hfr phages from one-liter samples of activated sludge effluent was 69%. Recovery from ten-liter samples of the effluent after primary clarification in a waste water reclamation plant was 72%, after seconary clarification 83%, and after sand filtration 91%. Polio 1, 2, and 3

viruses, reovirus, a rotavirus and seven different morphological types of coliphages were recovered from seeded 100-liter samples of distilled, tap or reclaimed water at an average efficiency of 94%. (Baker-FRC)
W81-04436

STATISTICAL ANALYSIS OF THE 1975 INTERCOMPARISON STUDY ON LAKE ERIE,
Ohio State Univ., Columbus. Dept. of Statistics.
P. I. Feder, and J. E. Zapotosky.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-107070, Price codes: A17 in paper copy, A01 in microfiche. In: Lake Erie Nutrient Control Program: An Assessment of Its Effectiveness in Controlling Lake Eutrophication, Environmental Protection Agency Report EPA-600/3-80-062, July, 1980. p 331-353, 1 Fig, 9 Tab, 1 Ref.

Descriptors: *Statistical analysis, *Water quality, *Sample preparation, *Sampling, *Nutrients, Experimental data, Ammonia, Silicates, Phosphorus, Nitrates, Nitrites, Research facilities, *Lake Erie.

Each of the three research groups presently monitoring physical, chemical, and biological parameters in Lake Erie sampled two stations in the lake. Samples were taken at three levels at each station, and each was divided into three for exchange amongst the groups. The parameters selected for statistical analysis were ammonia-nitrogen, nitrate-nitrite-nitrogen, soluble reactive phosphorus, total filtered phosphorus, total phosphorus (unfiltered), and total reactive silicate. For each parameter but ammonia, there were statistically significant differences among analysis group average determinations. The analysis group differences were especially large for soluble reactive phosphorus. No significant sampling group differences were evident. Sampling depth effects were important, especially at the inshore station. No systematic differences were evident between measurements on samples obtained via submersible pump or water bottles. The average nutrient levels at the inshore station were consistently higher than those at the more lakeward station. The variation between replicate pump samples was generally smaller than the whole sample variation. It is not clear whether the discrepancies between laboratories are random or systematic. (Brambley-SRC)
W81-04486

APPARATUS FOR DETECTING CHANGE IN WATER QUALITY,
Hitachi Ltd. (Japan). (Assignee).
T. Ikeguchi, S. Nogita, K. Otani, and S. Nishimura.
U.S. Patent No 4,220,858, 10 p, 9 Fig, 5 Ref; Official Gazette of the United States Patent Office, Vol 998, No 1, p 316, September 2, 1980.

Descriptors: *Patents, *Water pollution, *Water quality, Sampling, Water sampling, Toxicity, Aquatic life, Fish, Equipment.

The invention relates to an apparatus for detecting a change in water quality, applicable to detect, at an early stage, a change in water quality due to inflow of toxic materials soluble in water. Sample water is introduced into a water bath in which gold fish live, and a gas sparingly soluble in water and giving no effect upon biological activities of the fish is supplied. The supplied gas and carbon dioxide gas generated by the biological activities of the fish are collected, and a change in water quality of the sample water is detected from a concentration of carbon dioxide thus collected. (Sinha-OEIS)
W81-04534

SOLAR RADIATION INDUCES SUBLETHAL INJURY IN ESCHERICHIA COLI IN SEAWATER,
Harvard Univ., Cambridge, MA. Lab. of Microbial Ecology.
R. B. Kapuscinski,, and R. Mitchell.
Applied and Environmental Microbiology, Vol 41, No 3, p 670-674, March, 1981. 1 Fig, 2 Tab, 32 Ref.

Descriptors: *Bacterial ayalysis, *Sea water, *Escherichia coli, Bioindicators, Enteric bacteria, Solar radiation, Pollutant identification, Analytical techniques, Coliforms, Bacteria, Microbiology, Enzymes.

Sublethal injury was seen in Escherichia coli in coastal sea water after 0.5 to 5.25 hours expose to sunlight. This could lead to a low estimation of health risks associated with use of such water. To assess damage, exposed cells were compared with cells kept in the dark. Sunlight renders the bacteria sensitive to peroxide. When catalase or pyruvate peroxide scavengers are added to the media, cells can recover. The site of injury appears to be the catalase system. Therefore, additon of catalase to the culture media might improve the enumeration of E coli and other gram-negative bacteria in sunlit sea water. (Cassar-FRC)
W81-04540

EVALUATION OF THE TOTAL CARBONACEOUS BIOCHEMICAL OXYGEN DEMAND, USING A COMPENSATED RECORDING RESPIROMETER,
Meat Industry Research Inst. of New Zealand, Inc., Hamilton.
J. F. Heddle, and A. Tavener.
Applied and Environmental Microbiology, Vol 41, No 3, p 580-584, March, 1981. 2 Fig, 3 Tab, 24 Ref.

Descriptors: *Biochemical oxygen demand, *Water analysis, *Effluents, *Organic matter, Chemical oxygen demand, Suspended solids, Analytical techniques. Pollutant identification, Sewage effluents, Waste water treatment, Respirometers.

The total carbonaceous biochemical oxygen demand method, using a multichannel compensated recording respirometer, was more reproducible and faster than the current standard 5-day procedure. Using pure substrates, glucose and serum albumin, the stoichiometry, precision, and accuracy of the total carbonaceous method were similar for the three techniques tested-total suspended solids, change in COD, and direct bioxidation. When different types of sewage effluent were tested using the two methods, change in COD and complete degradation, results were not significantly different. The total suspended solids method, however, was less satisfactory. Advantages of the total carbonaceous BOD test with large volume respirometer over the BOD5 test are: large undiluted samples may be used, no nutrients or buffers must be added, and the effects of toxic substances, pH variations, and nutrient imbalances may be monitored. This method may not be suitable when samples contain a substantial quantity of nonbiodegradable organic matter. (Cassar-FRC)
W81-04541

ISOLATION OF CANDIDA ALBICANS FROM FRESHWATER AND SEWAGE,
Georgia State Univ., Atlanta. Dept. of Biology.
W. L. Cook, and R. L. Schlitzer.
Applied and Environmental Microbiology, Vol 41, No 3, p 840-842, March, 1981. 1 Tab, 11 Ref.

Descriptors: *Yeasts, *Microbiology, *Sewage effluents, *Candida albicans, Pollutant identification, Analytical techniques, Microorganisms, Cultures, Waste water, Rivers, Streams.

A two-step procedure for rapid identification of Candida albicans in clean and polluted water is described. Media inoculated with samples of sewage influent and effluent and surface waters were incubated at 37C for three days. All brown colonies 1.0 mm in diameter or larger with a dome shape and matte surface were transferred to a medium containing 0.1% 2,3,5-triphenyltetrazolium chloride (TTC). C. albicans and other yeasts incapable of reducing TTC, forming pink to deep red colonies after 24 hours. The range of numbers of C. albicans in 100 ml samples was as follows: sewage influent, 0-400; sewage effluent, 0-38; river water, less than 1; and stream water, 0-5. The great variation in yeast counts was attributed to variations in input, toxicities in the sewage, microbial antagonisms, and other factors. Of 51 plates with dome-shaped matte-textured colonies, only 23 were positively identified as C. albicans. (Cassar-FRC)
W81-04542

THE SIMULTANEOUS DETERMINATION OF ARSENIC, ANTIMONY, BISMUTH, SELENIUM AND TELLURIUM IN WATERS BY AN INDUCTIVELY COUPLED PLASMA/VOLATILE HYDRIDE METHOD,
Imperial Coll. of Science and Technology, London (England).
M. Thompson, B. Pahlavanpour, and L. T. Thorne.
Water Research, Vol 15, No 4, p 403-411, 1981. 1 Fig, 5 Tab, 5 Ref.

Descriptors: *Water analysis, *Metals, Arsenic, Antimony, Bismuth, Selenium, Tellurium, *Pollutant identification, Analytical techniques, Spectrometers, *Trace elements.

The inductively coupled plasma spectrometer (ICP) connected to a hydride generator was used to determine trace amounts of As, Sb, Bi, Se, and Te (concentrations 0.1-50 micrograms per liter) simultaneously in natural and spiked waters. The direct analysis method was quick, but at concentrations on 1-5 micrograms per liter precision was poor and recovery incomplete, especially for Te. Using preconcentration, precision at these lower levels was greatly improved, and interference from Cu was removed. The method was applied to spiked sea water, spiked internal supply water, and water from two local rivers. Analyses were stable in acid solution for up to eight days storage. This method allows preconcentration and analysis of over 100 samples per man day. (Cassar-FRC)
W81-04548

ACCUMULATION OF ZINC, CADMIUM, AND LEAD BY FIELD POPULATIONS OF LEMANEA,
Durham Univ. (England). Dept. of Botany.
J. P. C. Harding, and B. A. Whitton.
Water Research, Vol 15, No 3, p 301-319, March, 1981. 13 Fig, 9 Tab, 29 Ref.

Descriptors: *Aquatic plants, *Heavy metals, *Accumulation, Monitoring, Mine wastes, Lead, Zinc, Cadmium, Algae, Rivers, Bioindicators, Path of pollutants, Rivers, Britain, France, Germany, Ireland, Sardinia.

Concentrations of zinc, cadmium and lead in populations of the red alga Lemanea in fast-flowing rivers in Britain, France, Germany, Ireland and Sardinia are reported. Mining activities in the areas studied, either past or presently active mines, have affected the water quality. No evidence was found that algae populations differed genetically in their abilities to tolerate heavy metals. Samples of alga consisted of pooled 2 cm long terminal tips of filaments detached from about 1 square centimeter of rock surface. Significant positive correlations were noted between the logarithm of the mean concentration of zinc, cadmium and lead in four such samples collected from within 10 m reaches at 59 sites and the logarithm of the concentration of each metal in both unfiltered and filtered water. Enrichment ratios for each metal decreased with increasing aqueous metal concentraions. It is concluded that high levels of calcium resulted in decreased uptake of zinc. Part of the zinc content of filaments was sensitive to short-term fluctuations in concentrations in the surrounding water. It is suggested that the chemical analyses of natural or transplanted populations of Lemanea could provide a valuable aid in monitoring contamination of rivers by zinc, cadmium or lead. (Baker-FRC)
W81-04550

AROMATIC AMINES IN SURFACE WATERS OF THE NETHERLANDS,
Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands).
R. C. C. Wegman, and G. A. L. De Korte.
Water Research, Vol 15, No 3, p 391-394, March, 1981. 2 Fig, 3 Tab, 11 Ref.

Descriptors: *Aromatic compounds, *Rivers, *Rhine River, Surface waters, Aniline, Chloroani-

lines, Dichloroanilines, Methylanilines, Gas chromatography, Chromatography, Water pollution sources, Surface waters, Netherlands, Germany.

A monitoring program was conducted to determine the presence of individual aromatic amines in samples taken from the Rhine River. Compounds identified included aniline, 2-chloroaniline, 3-chloroaniline, 4-chloroaniline, 2,3- and 2,5-dichloroaniline, 2,4-dichloroaniline, 2,6-dichloroaniline, 3,4-dichloroaniline, 3,5-dichloroaniline, 2-methylaniline, and 4-methylaniline. In 1979 aniline, 2-, 3-, and 4-chloroaniline, 3,4-dichloroaniline and 4-methylaniline had a frequency of occurrence of over 50% in samples from the river Rhine at Lobith. 2,6-Dichloroaniline was never detected. In the river Boven Merwede, a tributary of the Rhine river, the median values for aniline, 2-chloroaniline and 3,4-dichloroaniline were higher than in the Rhine river itself. In the Meuse River at Eijsden, only the median values for aniline and 3,4-dichloroaniline were above the detection limits. In the river Meuse at Lith, aniline, dichloroaniline, and 2-, 3-, and 4-chloroaniline were detected frequently, but in low concentrations. It was concluded that the sources of the aromatic amines were located between Monheim and Duisburg-Ruhrort in the Federal Republic of Germany and between Loevestein and Ablasserdam in the Netherlands. The highest concentration was found in the river at Neuss-Dusseldorf. (Baker-FRC)
W81-04551

BROMINE TRACER STUDY OF THE CHLORINATION WITH HYPOCHLORITE IN A BUFFERED AND A NON-BUFFERED AQUEOUS SOLUTION CONTAINING CHLORIDE, BROMIDE AND PHENOL AS MODEL COMPOUND,
Keuring van Electrotechnische Materialen, N.V., Arnhem (Netherlands). Chemistry Dept.
F. Janssen, and J. Kanij.
Water Research, Vol 15, No 4, p 463-468, April, 1981. 4 Fig, 3 Tab, 29 Ref.

Descriptors: *Chlorination, *Cooling water, *Bromides, *Drinking water, Chlorine, Electric powerplants, Bromine, Halogens, Organic compounds, Hydrogen ion concentration, Gas chromatography, Phenols, Separation techniques, Environmental effects, Pollutant identification.

The chlorination of drinking water results in the formation of complex chlorinated organics which may be released into the ecosystem. There is confusion in the literature about the active brominating and chlorinating agents. To understand the role of the bromide ion in the chlorination of cooling water of electric power stations, a phenol-hypochlorite-bromide system was studied with the aid of the Br-82 radionuclide. The effect of pH on the system was examined as well as effect of the level of phenol in buffered and non-buffered systems through quenching with sulfite and using the solvent-solvent extraction technique. In the non-buffered solution (initial pH 7.0), approximately 8 atom-% bromine containing compounds were isolated from the reaction mixture; in the buffered system at pH 6.0 and 8.0, these values were 17 and 47 atom-%, respectively. Qualitative gas chromatographic analysis showed the presence of halogenated phenols and other non-phenolic compounds. (Geiger-FRC)
W81-04555

DETERMINATION OF OZONE IN WATER BY THE INDIGO METHOD,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland)
H. Bader, and J. Hoigne.
Water Research, Vol 15, No 4, p 449-456, April, 1981. 7 Fig, 4 Tab, 20 Ref.

Descriptors: *Pollutant identification, *Ozone, *Dyes, Water treatment, Water purification, Ozonation, Potable water, Spectrophotometry, Colorimetry, Drinking water, Color, Water analysis.

A method for determining the level of aqueous ozone in potable water is described. When the concentration of ozone cannot be measured directly by its ultraviolet absorption, the decolorization of indigo trisulfonate (600 nm, pH below 4) may be used to provide fast and stoichiometric results. The change in absorbance vs. ozone added may be expressed as -2.0 + or - 0.1 x 10 to the fourth power/mole/cm. The indigo method is independent of the concentration of aqueous ozone at levels of 0.005-30 milligrams/liter and offers a precision of 2% or 3 micrograms/liter for low concentrations if a good filter instrument or a spectrophotometer is employed. Visual techniques can be used for measurements of ozone at levels of 0.01 milligrams/liter. No interference occurs from secondary oxidants produced by ozone in natural waters, and the effects of chlorine can be masked. Reagent solutions are stable for 3 months, and the method is recommended for kinetic measurements, visual field tests, and research on ozonation processes. (Geiger-FRC)
W81-04556

RAPID AND PRECISE DETERMINATION OF TOTAL INORGANIC CARBON AND SOME GASES IN AQUEOUS SOLUTIONS,
Helsinki Univ. (Finland).
K. Salonen.
Water Research, Vol 15, No 4, p 403-406, April, 1981. 1 Fig, 3 Tab, 11 Ref.

Descriptors: *Inorganic compounds, *Carbon, *Water analysis, Separation techniques, Bubbling, Carbon dioxide, Dissolved solids, Organic compounds, Lakes.

A simple procedure based on the stripping method for the determination of total inorganic carbon and some gases in water is described. Water samples are injected via a very accurate syringe into a bubbling chamber where gases are stripped from the solution and carried to the analyzer. Acid is continuously fed to the bubbling chamber to convert carbonates to free carbon dioxide. Excess water is removed by a carrier gas and is separated by condensation. No manipulations are required other than the injection of samples into the bubbling chamber. One analysis takes only 20-40 sec to complete. Several experiments on lake water were performed to establish the optimum conditions of operation for the method. The volume of liquid in the bubbling chamber was found to have a considerable effect on the peak heights obtained. Dissolved inorganic and gaseous organic carbon were best determined quantitatively from injections of at least 2 milliliters in volume. The new procedure is recommended for use in limnology and hydrobiology, as well as for assessing production or respiration processes in aquatic communities. (Geiger-FRC)
W81-04559

A SUITABLE REPLACEMENT FOR TEEPOL 610 IN THE SELECTIVE ISOLATION OF COLIFORMS FROM MARINE WATERS AND SEWAGE,
Water Research Centre, Stenage (England).
G. Stanfield, and T. E. Irving.
Water Research, Vol 15, No 4, p 469-474, 1981. 5 Tab, 6 Ref.

Descriptors: *Culturing techniques, *Coliforms, *Membrane filters, Bacterial analysis, Isolation, Enteric bacteria, Bacteria, Escherichia coli, Water quality, Sewage, Waste water, Salinity, Seawater, Solar radiation, Drinking water, Surfactants, United Kingdom.

In the United Kingdom, the recommended membrane-filtration procedure for the determination of total coliform and Escherichia coli in drinking water, waste water and effluents routinely utilized a growth medium containing the detergent Teepol 610 as a selective agent. In July of 1976, Shell Chemicals stopped the production of Teepol 610 and offered Teepol HB6 as an alternate product. Preliminary tests showed that the substitute was unsuitable because it inhibited the growth of coliforms at 0.4%. Sodium lauryl sulfate at 0.1% weight/volume has been demonstrated to be an effective alternative to Teepol 610. Percentages of colonies confirmed as coliforms and presumptive counts were nearly identical in comparative tests using 0.4% Teepol or 0.1% lauryl sulfate as the selective agent in the membrane filtration process. Sodium lauryl sulfate may be easily prepared using the same Oxoid dehydrated broth base and gives adequate results for coliform counts even when subjected to high salinities and large amounts of solar radiation. (Geiger-FRC)
W81-04560

EXCLUSION CHROMATOGRAPHY WITH CARBON DETECTION. A TOOL FOR FURTHER CHARACTERIZATION OF DISSOLVED ORGANIC CARBON,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
R. Gloor, H. Leidner, K. Wuhrmann, and T. Fleischmann.
Water Research, Vol 15, No 4, p 457-462, April, 1981. 9 Fig, 22 Ref.

Descriptors: *Pollutant identification, *Organic carbon, *Quantitative analysis, Dissolved solids, Organic wastes, Pollutants, *Gas chromatography, Molecular weight, Ion exchange, Separation techniques, Organic compounds.

As part of an ongoing research project, a method for the quantitative determination of molecular weight distributions of organic compounds in natural waters was devised. Samples containing at least 1.0 milligram of dissolved organic carbon (DOC) were subjected to ion exchange without the loss of any organic carbon. Exclusion chromatography was performed using either the new silica-based packing TSK SW or Sephadex as a separation medium. An on-line DOC detector was used to monitor column effluents for organic carbon. The chromatograms represented the molecular weight distribution of all the organic carbon in the sample, and the total area of the record equaled the total DOC. The method was successfully utilized in such applications as the ozonation of lake water, the treatment of waste water and the infiltration of groundwater. It was suggested that the method would be useful in the preparation of fractions for later identification as fraction volumes accumulate. (Geiger-FRC)
W81-04561

EVALUATION OF A BACILLUS SUBTILIS REC-ASSAY FOR THE DETECTION OF MUTAGENS WHICH MAY OCCUR IN WATER ENVIRONMENTS,
Kanazawa Univ. (Japan). Dept. of Construction and Environmental Engineering.
S. Matsui.
Water Research, Vol 14, No 11, p 1613-1619, November, 1980. 11 Fig, 6 Tab, 6 Ref.

Descriptors: *Bacteria, *Assay, *Chromium, Dyes, Bacillus, Water analysis, Mutagenicity, Mutagens, Pollutant identification.

The DNA repair-deficient Bacillus subtilis system was employed for the detection of mutagens that may occur in water environments. Two strains were used: NIG 45, which has a high sensitivity to gamma rays, ultraviolet light, and chemical drugs, and a wild-type strain, NIG 17. The liquid cultivation method was applied and resulted in the detection of mutagens in very low concentration. Hexavalent chromium indicated very strong mutagenicity, and heptavalent manganese indicated weak mutagenicity. NIG 45 showed an adverse growth effect at a chromium concentration of 0.5 mg/liter, while NIG 17 showed the adverse effect at 1.0 mg/liter. Thus, the rec-assay of Bacillus subtilis is a good method of monitoring mutagens in a water environment. The effect of a combination of two mutagenic substances, chromium and mitomycin, was additive rather than multiple. The combination of chromium and a non-mutagenic substance, mercury, did not enhance the mutagenicity of mercury. Among test dyes, acridine orange, acridine yellow, and methyl violet indicated strong mutagenicity. (Small-FRC)
W81-04562

EQUILIBRIUM MODEL OF FATE OF MICRO-CONTAMINANTS IN DIVERSE AQUATIC FOOD CHAINS,
Manhattan Coll., Bronx, NY.
For primary bibliographic entry see Field 5B.
W81-04570

DETERMINATION OF RESIDUAL CHLORINE BY DERIVATISATION WITH 2,6-DIMETHYLPHENOL AND GAS CHROMATOGRAPHIC SEPARATION,
Wollongong Univ. (Australia). Dept. of Chemistry.
J. Ellis, and P. L. Brown.
Analytica Chimica Acta, Vol 124, No 2, p 431-436, March 1, 1981. 1 Fig, 1 Tab, 13 Ref.

Descriptors: *Chlorine, *Bromine, *Water analysis, Cooling water, Analytical techniques, Pollutant identification, Chromatography, Seawater.

Residual chlorine in water determined by reacting with 2,6-dimethylphenol to form 4-chloro-2,6-dimethylphenol, which was extracted with hexane and determined by gas chromatography using a flame ionization detector. The internal standard was 4-bromo-2,6-dimethylphenol. Recovery was greater than 99%, and precision was 0.6% at concentration as low as 0.01 mg per liter. This method is free of interference from colored solutes and other oxidizing agents, such as iodate and chloramines. Standard deviations for Cl concentrations of approximately 0.1 to 10 ppm were 1.1-0.36%; and in the presence of 30 mg per liter dichromate, 2.71-1.19%. Simulated sea water samples were analyzed using 2,4,6-trichlorophenol as an internal standard. Rescoveries Cl (11.8 mg per liter), 11.6 + or - 0.14 mg per liter; and Br (1.34 mg per liter), 1.33 + or - 0.04 mg per litter. (Cassar-FRC)
W81-04577

THE IDENTIFICATION OF CHLOROPHENOXYPHENOLS IN SOIL AND WATER SAMPLES BY SOLVENT EXTRACTION AND FIELD DESORPTION MASS SPECTROMETRY,
Oregon Graduate Center, Beaverton. Dept. of Environmental Science.
J. F. Pankow, L. M. Isabelle, and D. F. Barofsky.
Analytica Chimica Acta, Vol 124, No 2, p 357-364, March 1, 1981.

Descriptors: *Phenolic pesticides, *Pollutant identification, *Mass spectrometry, Pesticides, Fungicides, Herbicides, Soil analysis, Water analysis, Soil contamination, Water pollution, Pollutants, Chlorinated hydrocarbons, Separation techniques.

The identification of microgram levels of chlorophenoxyphenols by solvent extraction followed by field desorption mass spectrometry is described. The solvent extractions of natural and spiked water samples were performed under acidic conditions, with little interference from fulvic or humic acids. Mass spectra were obtained with a single focussing mass spectrometer modified with a field ionization/field desorption ion source, a magnet capable of extending the practical field desorption mass range to 950 atomic mass units, and a PAR/SSR ion counting detection system. The clear patterns obtained for the oligomeric series and the chlorine isotope clusters of the chlorophenoxyphenols show the suitability of the method for the routine and rapid screening of liquid samples for these contaminants. (Geiger-FRC)
W81-04578

UTILIZATION OF FLOW INJECTION WITH HYDRAZINE REDUCTION AND PHOTOMETRIC DETECTION FOR THE DETERMINATION OF NITRATE IN RAIN-WATER,
University of Central Florida, Orlando. Dept. of Chemistry.
B. C. Madsen.
Analytica Chimica Acta, Vol 124 No 2, p 437-441, March 1, 1981. 3 Fig, 9 Ref.

Descriptors: *Nitrates, *Rain water, *Water analysis, Hydrazine reduction method, Flow injection method, Analytical techniques, Pollutant identification.

The hydrazine reduction method for determining nitrate at the ppm level in rainwater was adapted to a flow injection procedure with colorimetric detection. Forty samples per hour can be processed. Precision was 3% in the range 1 to 10 ppm nitrate. Recovery of nitrate in spiked samples (0.80 and 0.20 ppm nitrate added) was 107%, respectively. Comparison of results of rainwater sample analysis by flow injection and by ion chromatography showed no significant difference in the two methods. The large excess of sulfanilamide, used with naphthylenediamine hydrochloride and hydrochloric acid as the color reagent, required by previous techniques was not needed here. (Cassar-FRC)
W81-04579

TRACE METALS IN CONTAMINATED WATERS,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
G. Sposito.
Environmental Science and Technology, Vol 15, No 4, p 396-403, April, 1981. 3 Fig, 5 Tab, 38 Ref.

Descriptors: *Model studies, *Trace elements, *Metals, Chelation, Fulvic acids, Sewage, *Pollutant identification, Computer programs, Mathematical studies, Water analysis, Chemical properties, Organic acids, Effluents, Toxicity.

Models are available to study trace metals in sewage and natural waters. Since complexation reactions are rapid, equilibrium chemical models may be used. Toxicity is related to complexation and speciation; strongly complexed trace metals are less toxic than weakly complexed or free ionic forms, and speciation is more significant than total metal concentration. Thus 8 common metals may be rated (starting with the most toxic) as follows: Hg(2+), Cu(2+), Pb(2+), Cd(2+), Cr(3+), Zn(2+), Ni(2+), and Al(3+). Two types of chemical models are used to describe quantitatively the reactions between trace metals and organic compounds in sewage--mixture models, based on selected complexing organic acids, and quasiparticle models, incorporating hypothetical macromolecules closely mimicking the properties of the natural organic compounds. One particular model deals with fulvic acid fractions of municipal sewage sludge. Computer models involved numerical solutions of equations generated by the combination of mole balance with conditional stability, redox, and formation constants. Examples are given in which a mixture model is incorporated into a computer program to predict the speciation of 4 trace metals in natural waters. Mixture models are easier to apply to natural waters and are easier to interface with computer programs, but they are difficult to validate directly. The quasiparticle models have limited applicability, but are useful in calibration of mixture models. (Cassar-FRC)
W81-04581

A SIMPLE MAXIMUM-MINIMUM SALINITY SAMPLER,
James Cook Univ. of North Queensland, Townsville (Australia). School of Biological Sciences.
T. Walker.
Limnology and Oceanography, Vol 25, No 6, p 1122-1123, November, 1980. 2 Fig, 1 Ref.

Descriptors: *Water sampling, *Saline water, Sampling, Salinity, Estuaries, Water samples, *Water sampling apparatus.

An apparatus which collects estuarine water samples at the points of maximum and minumum salinity consists of two 130-ml bottles with rubber stoppers pierced by two thin rigid plastic tubes. One tube runs from stopper to bottom of the bottle; the other extends outward from the stopper. Both bottles are filled with ambient saline water and fixed to a rope or stake. One bottle is inverted, one is upright. When salinity changes, the upright bottle contents are displaced by denser salt water and the inverted bottle contents by the less dense water. For example, bottles filled with water of initial salinity, 19.5 parts per thousand, contained 17.4 parts per thousand and 28.9 parts per thousand after two tidal cycles, and accuracy of results was within 5%. Bottle volume, tube diameter and length, and duration of sampling may be adjusted to suit conditions. (Cassar-FRC)
W81-04596

SPECTROPHOTOMETRIC DETERMINATION OF MERCURY USING 2-(5-BROMO-2-PYRIDYLAZO)-5-DIETHYLAMINOPHENOL,
China Science and Technology Univ., Hefei. Dept. of Chemistry.
F. Wei, Y. Zhu, and F. Yin.
Analytical Letters, Vol 13 (A17), p 1533-1540, 1980. 1 Fig, 3 Tab, 7 Ref.

Descriptors: *Mercury, *Spectrophotometry, *Water analysis, Sludge, Waste water(Pollution), Heavy metals, Pollutant identification, Analytical techniques.

Mercury in industrial waste water and sludge was determined by spectrophotometry using 2-(5-Br-2-pyridylazo)-5-diethyl aminophenol to form a 1:2 purple complex which is more soluble and stable in the presence of Triton X-100. Maximum absorption occurs at 565 nm. Molar absorptivity is 110,000. Positive errors are produced by heavy metal ions, divalent Cu, Co, Ni, Mn, and Fe(3+). Thiocyanate, iodine, and cyanide ions at 1,000 micrograms produce negative errors. The following ions do not interfere: Na, NH4, NO3, SO4, B4O7, and Br at 1,000 micrograms: Au(3+) at 20 micrograms and Pt(4+) at 10 micrograms. Sludge, but not waste water, samples must be predigested. (Cassar-FRC)
W81-04600

GERMINAL CELL MUTAGENESIS IN SPECIALLY DESIGNED MAIZE GENOTYPES,
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
M. J. Plewa, and E. D. Wagner.
Environmental Health Perspectives, Vol 37, p 61-73, January, 1981. 8 Fig, 6 Tab, 59 Ref.

Descriptors: *Mutagenesis, *Phytotoxicity, *Bioindicators, Municipal wastes, Municipal waste water, Sludge, Pesticides, Corn, Herbicides, *Water pollution effects, Pesticide toxicity, Pollen, Bioassay, Monitoring.

Plant genetic assays are good indicators of environmental mutagens and are used as in situ monitors of polluted air, water, and soil. The mutagenic properties of 32 pesticides to inbred W22 maize plants homozygous for wx-C were examined under modern agriculture conditions. Herbicides which induced a mutagenic response included cyanazine, SD50093 (atrazine + cyanazine) and procyazine + Dual. In situ and laboratory studies were conducted on three inbred strains of Zea mays to determine the action of environmental mutagens present in Chicago municipal sewage sludge. The frequency of mutant pollen grains in inbred M14 at both the wx-C and wx-90 heteroalleles was measured in plants exposed to various concentrations of the sludge under field conditions. In laboratory tests, an inbred Early-Early Synthetic strain was tested with the known mutagens ethyl-methanesulfonate (EMS) or maleic hydrazide (MH), and forward mutations at the locus were measured in the pollen grains. MH and EMS were mutagenic at levels of 10 nanomoles and 1 micromole, respectively. Levels of the mutants were calibrated in Early-Early Synthetic to a linear increase in the frequency of forward mutant pollen grains. A maize assay for environmental mutagens is being constructed to monitor forward or reverse mutations in somatic cells and cytogenetic changes in root-tip cells. (Geiger-FRC)
W81-04636

MERCURY LEVELS IN SOME RED SEA MARINE PELAGIC AND BENZIC FOOD CHAIN INDIVIDUALS AND THEIR BIOTA,
Alexandria Univ. (Egypt). Faculty of Sciences.
A. M. Hilmy, M. B. Shabana, and M. M. Saied.
Comparative Biochemistry and Physiology C: Comparative Pharmacology, Vol 68, No 2, p 195-197, 1981. 17 Ref.

Descriptors: *Mercury, *Trace elements, *Marine animals, Heavy metals, Food chains, *Red Sea, Mollusks, Crustaceans, Fish, Baseline studies, Atomic absorption spectrophotometry, Photometry, Shrimp.

Due to the absence of data on mercury in naturally occurring marine Red Sea organisms and their marine environment, a study was undertaken to establish baseline levels for the concentration of mercury in three experimental animals whose individuals comprise a simple, but important, marine food chain in the Red Sea. The animals selected were Modiolus modiolus (Lamark), a mollusk; Sergestes lucens (Hansen), a crustacean; and the teleost Aphanius dispar (Ruppell), a fish. All samples and species assayed were collected in the summers of 1976, 1977, and 1978 in the vicinity of Al Ghardaqa, Egypt. Atomic absorption photometry was used to determine the mercury levels in the samples. The average content of mercury in the sampled station was 0.05 parts per billion (ppb) $Hg2+$ for water and 0.17 ppb for sediments. In the animal samples, the average mercury levels were 0.33 ppb for the mollusks, 0.25 ppb for the crustaceans, and 0.50 ppb for the fish fingerlings. These mercury levels can be regarded as negligible and represent baseline in data for future studies in this area. (Carroll-FRC)
W81-04641

AN EXTENSION INFORMATION PROGRAM TO IMPROVE RESIDENTIAL WELL WATER QUALITY,
Wisconsin Univ.-Extension, Madison.
G. R. Gibson, Jr.
Water Resources Bulletin, Vol 17, No 1, p 138-141, February, 1981. 1 Fig, 1 Tab, 10 Ref.

Descriptors: *Wells, *Infiltration, *Education, Community development, *Water quality, Septic tanks, Sand, Soil types, Well seepage, Seepage, Well water, Drinking water, Domestic water, Public health, *Wisconsin, Rural areas.

A public information program was designed and put into operation at inland lake communities in Wisconsin. The program's purpose was to inform the residents of these communities that homes situated on sandy soils with high water tables and shallow wells near to their own or a neighbor's septic system may have drinking water which is to some degree contaminated. As an incentive to attend the educational sessions, free water analyses were performed on the resident's well water. Homes such as these are generally beyond the reach of the federal Clean Drinking Water Act and are also fairly much exempt from local codes and regulations concerning drinking water. Public response has been good thus far, with a surprisingly large number of wells showing at least some degree of contamination. (Baker-FRC)
W81-04650

5B. Sources Of Pollution

CHLORIDE IN NATURAL CONTINENTAL WATER--A REVIEW,
Geological Survey, Menlo Park, CA. Water Resources Div.
J. H. Feth.
Available from Supt. of Documents, GPO, Washington, DC 20402, Price, $2.00. Geological Survey Water-Supply Paper 2176, 1981. 30 p, 7 Fig, 3 Tab, 145 Ref.

Descriptors: *Chlorides, *Surface water, *Groundwater, Natural waters, Precipitation, Hydrologic cycle, Aquifers, Streams, Thermal springs, Sodium chloride, Saline water, Brines.

Chlorine is the 15th most abundant element in the outer lithosphere, but the most abundant in the hydrosphere which is dominated by the oceans. Chloride, (Cl) is probably present in all natural water although small concentrations have defied detection. Concentrations in both surface and groundwater range from 0.02 mg/L or less, to more than 200,000 mg/L. Cl is present in all animal and plant tissues, estimated concentrations ranging from 100 to 1,000 ppm. Cl enters terrestrial water from atmospheric precipitation, dissolution of rocks, animal and industrial wastes, Salt used to deice highways, by upward and lateral movement of brines, and from other sources. Cl is the ion that dominates discussion of 'cyclic salts,' the concept that salts are entrained in moving air masses over the oceans, precipitated on land masses, and returned to the sea in runoff. The cycle exists but is not adequate to explain all the Cl borne to the oceans in streams and by discharge of groundwater. Unexplain phenomena include the origin of Cl in aquifers where year after year the concentration, large or small, remains virtually constant, and the origin of Cl in high concentrations in thermal springs rising from granitic terrane. The first suggests release at a constant rate from some undiscovered source. The second seems to require a source of Cl other than the granitic rocks whose Cl content is notably small. Saline springs, some originating in terrane underlain by evaporites, contribute large tonnages of Cl to streams. Individual sources in Texas (270,000 to 320,000 t/yr), Arizona (145,000 t/yr), and Idaho (14,000 t/yr) suggest the magnitude of the occurrence. Cl generally does not enter into oxidation or reduction reactions. Its main exchange activity is between solid sodium chloride and the chloride ion. Derivation of subsurface brines with dissolved-solids concentrations in the range 50,000 to more than 200,000 mg/L is generally explained by a process of ion filtration that takes place as water moves slowly through clay or shale confining layers.
W81-04333

EFFECTS OF STORM RUNOFF ON WATER QUALITY IN THE MILL CREEK DRAINAGE BASIN, WILLINGBORO, NEW JERSEY,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 5C.
W81-04343

NITROGEN IN GROUNDWATER AND SURFACE WATER FROM SEWERED AND UNSEWERED AREAS, NASSAU COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Reston, VA. Water Resources Div.
S. E. Ragone, B. G. Katz, G. E. Kimmel, and J. B. Lindner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-188450, Price codes: A04 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 80-21, 1980. 64 p, 27 Fig, 14 Tab, 44 Ref.

Descriptors: *Nitrogen, *Groundwater, *Surface waters, *Water pollution sources, Sewers, Water quality, Storm runoff, Precipitation, Aquifers, Wells, Nitrates, Fertilizers, Septic tanks, *New York, Long Island, *Nassau County.

Data on nitrogen in groundwater and surface waters in the sewered and unsewered parts of Nassau County were analyzed to evaluate the principal sources of nitrogen and to determine what factors significantly affect its concentration in the upper glacial aquifer and the underlying Magothy aquifer. Nitrate data for water samples collected during 1952-76 show that: (1) median nitrate concentration of water in the sewered part of the entire thickness of the upper glacial aquifer is not significantly different (at the 0.95 confidence limit, $N = 1400$) from that in the unsewered area, (2) median nitrate concentrations in the upper 3 meters of the upper glacial aquifer are significantly lower (at the 0.90 confidence limit, $N = 15$) in the sewered area than in the unsewered area, (3) in the sewered area, water from 8 of 10 wells in the upper glacial aquifer shows significantly decreasing nitrate concentration with time, (4) total nitrogen concentrations in streams draining the sewered area are significantly lower than in those draining the unsewered area, (5) from more than 2,000 nitrate analyses of water in the Magothy aquifer collected from 1952-76, it was found that nitrate is present at all depths but that nitrate concentrations decrease with depth, and (6) although water from most Magothy wells having long-term nitrate records shows no significant change in nitrate concentration with time, where the change is significant, nitrate is increasing. (USGS)
W81-04347

CHEMICAL CHARACTER OF GROUNDWATER IN THE SHALLOW WATER-TABLE AQUIFER AT SELECTED LOCALITIES IN THE MEMPHIS AREA, TENNESSEE,
Geological Survey, Memphis, TN. Water Resources Div.
W. S. Parks, D. D. Graham, and J. F. Lowery.
Available from the OFSS,USGS, Box 25425, Denver Fed. Ctr., Denver, CO 80225, paper copy $4.00, microfiche $3.50. Geological Survey Open-File Report 81-223, 1981. 29 p, 6 Fig, 4 Tab, 5 Ref.

Descriptors: *Water quality, *Groundwater, *Water table aquifer, *Observation wells, Sampling, channel analysis, Water supply, Geologic units, Aquifer characteristics, Recharge, Leakage, Waste disposal, Landfills, Waste dumps, Water pollution, Pollutant identification, *Tennesses, *Memphis, Memphis Sand.

Eight deep wells are being monitored in the Memphis, Tenn., area to detect any changes in the chemical character of water moving through the Memphis Sand towards major pumping centers. These wells are strategically located so as to intercept groundwater enroute through the Memphis Sand from the outcrop-recharge area. Although water quality analyses are available for many wells in the shallow water-table aquifer, no specific investigation has been made to characterize the quality of the water in this aquifer from which the Memphis Sand also receives part of its recharge. This investigation is to determine the chemical character of groundwater in the shallow water-table aquifer at selected localities in the Memphis area. Methods used to install eight shallow wells at abandoned dump sites containing chemical and/or industrial waste are described. Water samples from the eight shallow wells and two deep wells in the Memphis Sand were collected and analyzed. Results of the analysis are presented and the locations of the wells and dumps are shown on maps. (USGS)
W81-04358

HEALTH AND ENVIRONMENTAL EFFECTS OF SYNTHETIC FUEL TECHNOLOGIES: RESEARCH PRIORITIES,
Mitre Corp., McLean, VA. METREK Div.
Report to the Federal Interagency Committee on the Health and Environmental Effects of Energy Technologies, Report MTR-80W348, April, 1981. 236 p, 2 Fig, 3 Tab. DEAC-01-79-EV10018.

Descriptors: *Oil shale, *Coal gasification, *Research priorities, *Water pollution sources, Groundwater pollution, Water quality, Coal mining, Fuel, Industrial waste water, Land use, Leachates, Solid waste disposal.

The term synthetic fuels, as used in this report is restricted to fuels derived from coal and oil shale. Priorities for health effects, air quality, and ecological effects research related to coal gasification and liquefaction, and oil shale development are listed according to major area of concern. These are categorized as to generic, region-specific, or process-specific research. Generic and process-specific occupational safety and health research is a high priority. Research on air quality focuses on the chemical transformation of airborne pollutants which emanate from synthetic fuel plants as they interact with other pollutants, catalysts, moisture, and sunlight within the ambient atmosphere. Ecological effects research related to synthetic fuels focuses on terrestrial and aquatic ecosystems, especially forests, grasslands, and agricultural systems. With respect to aquatic research, broad areas of high priority research relate to liquid product and waste water spills, solid waste disposal and reclamation, changes in land use patterns and secondary impacts, and test and evaluation development of techniques unique to synfuels research. Many projects within this category involve assessing changes in the quality of groundwater and can be applied to pollutants from underground coal gasification or oil shale retorting, as well as leachates from waste materials. (Moore-SRC)

W81-04374

MOVEMENT AND EFFECTS OF COMBINED SEWER OVERFLOW SEDIMENTS IN RECEIVING WATERS,
Colorado State Univ., Fort Collins. Engineering Research Center.
S. L. Klemetson, T. N. Keefer, and R. K. Simons.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-107120, Price codes: A07 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-80-126, August, 1980. 148 p, 36 Fig, 23 Tab, 71 Ref.

Descriptors: *Combined sewer overflows, *Sediment transport, *Urban runoff, *Mathematical models, Flow characteristics, Sediment load, Storm runoff, Water pollution sources, Model studies, Low flow, Floods, Rivers.

Combined sewer overflows (CSO) are made up of urban surface runoff and sanitary sewage. Urban surface runoff makes up the majority of a CSO, so the characteristics of CSO sediment material for model development were taken to be those of street surface solids. The size distribution of street surface solids appears to be reasonably well defined log-normal distribution. A wide variety of constituents may be found, ranging from metallic elements to pesticides. The feasibility of modeling the movement of CSO sediments was investigated using a 64.37 km reach of the Cuyahoga River between Akron and Cleveland, Ohio. Two small diversion structures formed sediment trap areas, and the downstream end of the reach included the Cuyahoga estuary into Lake Erie. Sediment transport routines from a watershed model were combined with a linear implicit finite difference flow model for use in the feasibility study. Experiments indicate that the movement of hypothetical sediment loads may be successfully modeled. Under normal low flow conditions, sediments accumulate near the bypass outfall. A flood will move coarse sediments from the outfall to the small trap areas. Fine material moves through the reach and settles in the estuary under all flow conditions. It was concluded from the model experiments that qualitative evaluation can be made concerning the fate of CSO solids which are primarily noncohesive sands. Semi-quantitative evaluations could be made if proper data from a particular CSO could be obtained. Particularly important to the model are the size distribution and settling velocity characteristics of the CSO sediments. (Moore-SRC)
W81-04375

TRACE METALS AND STATIONARY CONVENTIONAL COMBUSTION PROCESSES,
Radian Corp., Austin, TX.
L. O. Edwards, C. A. Muela, R. E. Sawyer, C. M. Thompson, and D. H. Williams.
Environmental Protection Agency Project Summary EPA-600/S7-80-155, February, 1981. 11 p, 9 Tab.

Descriptors: *Trace elements, *Coal, *Fuel, *Powerplants, *Environmental effects, *Water pollution sources, Industrial wastes, Leaching, Groundwater pollution, Toxicity, Solid wastes, Landfills, Natural gas, Fuel oil.

The shift in principal feedstocks for electrical power generation from natural gas and fuel oil to coal has stimulated concern about trace element emissions. A search of United States literature was performed to identify published information on trace elements and Stationary Conventional Combustion Processes (SCCP). Included in the SCCP category are utility, industrial, commercial and residential combustion sources. Emissions from the combustion of coal, oil, natural gas, wood, and refuse were considered for each combustion source. Coal is identified as the fuel of most concern; generally, trace element levels in coal are similar to their crustal abundances. Emissions to air, water, and soil, including trace element leaching studies, are covered. Most trace elements discharged during the combustion process leave as a solid waste. The disposal of this solid waste at landfills is potentially hazardous because trace elements may be mobilized through leaching, contaminating the surrounding soil and groundwater. Major aqueous streams leaving the combustion process are often associated with ashes or other solids containing ashes. Aqueous effluent streams, which often contain trace elements leached from ashes, include ash sluice water, ash pond liquor, and liqour associated with flue gas desulfurization scrubbers. Emissions from coal-fired power plants represent a significant percentage of the anthropogenic contribution for some trace elements, some of which are potentially harmful to materials and biological systems. (Moore-SRC)
W81-04382

PREDICTING OXYGEN AND NITROGEN ABSORPTION RATES FROM SUBMERGED SUSPENSIONS OF GAS BUBBLES,
Rogaland Distriktshogskole, Stavanger (Norway). Dept. of Teknisk Miljovern.
T. Bilstad, and E. N. Lightfoot.
Progress in Water Technology, Vol 12, No 6, p Tor 23-35, 1980. 10 Fig, 5 Tab, 13 Ref.

Descriptors: *Absorption, *Oxygen, *Nitrogen, High pressure, Fishkill, Spillways, Mathematical models, Flow, Mass transfer, Bubbles.

The rate of oxygen and nitrogen absorption from bubbles to water under elevated pressures was studied because aeration at elevated pressures which occurs naturally below dams and waterfalls has been linked with fish kills. U-tube aeration and a flow model were also evaluated. The research concentrated on two flow situations: concurrent constant pressure flow in a horizontal tube to explaining the preferential nitrogen saturation found in earlier studies, and concurrent non-isobaric flow in a U-tube for calculation of mass transfer coefficients as a function of position and operating conditions. U-tube aeration was found to be effective and explained the high nitrogen saturation responsible for fish kills under natural conditions. It was possible to predict volumetric mass transfer rates for both oxygen and nitrogen in terms of bubble size and number concentration, on the basis of the surface stretch modification of the penetration theory. (Small-FRC)
W81-04402

VARIABILITY OF BACTERIAL COUNTS IN COASTAL WATERS,
Water Pollution Research Lab., Stevenage (England).
A. L. H. Gameson.
Water Science and Technology, Vol 13, No 1, p Tor, 481-489, 1981. 3 Fig, 4 Tab, 9 Ref.

Descriptors: *Monitoring, *Sewage bacteria, *Coastal waters, Bacteria, Variability, Outfall, Outfall sewers, Waste water outfall, Waste water disposal, Waste water, Waste water composition.

The wide variations in bacterial counts present in sewage by the time it reaches the submarine sewage outfall location are considered. Data were obtained from several sites over extended periods of time so as to allow these variation to be noted. At each of the 9 sites tested, sewage was released into the water after no more than preliminary treatment. The water body into which the sewage was released had strong tidal currents. The degree of prelminary treatment ranged from none, through disintegration, screening and comminution. The methods of discharge included gravity, pumping or combinations of gravity and pumping. Dumping was continuous, intermittent, or released over an hour or two in each tidal cycle. The bacterial counts taken tend to be log-normally distributed, and a suitable measure of the variability may be obtained by using the antilogarithm of the standard deviation of logarithms of the counts. (Baker-FRC)
W81-04416

INVESTIGATIONS INTO SEWAGE GREASE BEHAVIOR IN COASTAL WATERS,
Australian Atomic Energy Commission.
A. Davison, J. F. Easey, J. J. Varjavandi, and K. M. Warner.
Water Science and Technology, Vol 13, No 1 , p Tor 499-508, 1981. 5 Fig, 6 Ref.

Descriptors: *Grease, Ocean circulation, *Waste water disposal, Waste water, Ocean dumping, Waste disposal, Monitoring, Isotopic tracers, Tracers, Path of pollutants, *Coast waters, *Sydney , Australia.

Sewage grease dispersion was investigated at the Malabar catchment, which discharges to the ocean at a large outfall and serves a population of over 1 million persons plus the bulk of the industrial activities of Sydney, Australia. Design sewage flows are 500 million liters per day average for dry weather and 1100 million liters per day average for wet weather. The levels of grease in the influent to the Plant vary considerably, but a figure of 100 mg/liter for influent and 70 mg/1 for treated effluent were taken as the average for this study. Oil and grease originate normal domestic and industrial operations and are only partially treated or removed at primary sewage treatment plants such as this one. At the Malabar plant primary treatment effectively treats and removes only about 45% of the total grease arriving at the plant. Gold-198 isotope was used as a tracing technique for monitoring the movement of middle and sludge grease fractions of the treated sewage in the ocean. The overall behavior of the sewage plume was typical of the interaction of liquids with different temperatures and densities in that the less dense material surfaced. Surface trapping occurred, and plume movement was dictated by weather conditions. A 10-fold dilution of sewage effluent occurred within 100 km of the outfall. A finely dispersed portion of the effluent grease mixes with the ocean water and disperses continuously. (Baker-FRC)
W81-04418

MOVEMENT OF MERCURY FROM MINAMATA BAY INTO YATSUSHIRO SEA,
National Research Council of Canada, Ottawa (Ontario). Div. Biological Sciences.
A. Kudo, S. Miyahara, and D. R. Miller.
Water Science and Technology, Vol 13, No 1, p Tor 509-524, 1981. 6 Fig, 5 Tab, 29 Ref.

Descriptors: *Mercury, *Monitoring, *Minamata Bay, Methylmercury, Distribution, Agricultural chemicals, Sediments, Heavy metals, Sediments transport, Migration, Path of pollutant, Japan.

The present study was undertaken with the hope of obtaining some quantitative information regarding the long-term movement of mercury when it is associated with bed sediments. The area and time of study was Minamata Bay from 1960 to the present. In 1960-1975, about 9 tons of mercury moved from the Bay. Between 1975 and 1978, almost 17 tons moved out to sea. The increase of methylmercury in Yatsushiro Sea bed sediments was 0.10 tons, from 0.56 tons in 1975 to 0.66 tons in 1978, or a 5.8%/yr increase. Total mercury in sea bed sediments increased at a rate of 42%/yr. According to measurements taken in bed sediments of the Yatsushiro Sea outside Minamata Bay during 1975 and subsequent years, the majority of samples contained less than 1 ppm mercury, and the degree of contamination dispersed ouside the Bay is not viewed as serious at this time. However, the rapid acceleration of mercury movement in the past few years indicates that this contamination could become serious in areas beyond the Bay. (Baker-FRC)
W81-04419

AN APPRAISAL OF BACTERIAL INDICATORS OF POLLUTION IN SEA WATER,
Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
E. M. Evison, and E. Tosti.
Water Science and Technology, Vol 13, No 1, p Tor 591-599, 1981. 3 Fig, 3 Tab, 8 Ref.

Descriptors: *Bacteria, *Seawater, *Monitoring, Bottom sedients, Sewage bacteria, Escherichia coli, Streptococcus, Saline water, Coastal waters, Bays, *Naples Bay.

Several different approaches were used to study and compare the survival characteristcs of fecal

streptococci and E. coli in sea water. Sea water in the Bay of Naples was used for this study, with particular attention given to the area from the Harbor of Mergellina to the Castel dell'Ovo. Several storm water outfalls pollute this area, especially in the winter. Occasionally, raw sewage is also discharged here when the normal sewage collection system is overloaded. Possible contamination from the port of Naples is also present when there is a strong current from the East. Water depth ranges from 3-5 m at the shore to 30 m at one site. Sandy sediment covers the whole floor of the bay. Laboratory studies were also conducted for further refinement of study of specific envionmental conditions. The results indicate that fecal streptococci survive longer than E. coli in sea water. The more rapid reduction in E. coli occurred under entirely natural conditions. Sediment samples also indicated longer survival for the fecal streptococci. (Baker-FRC)
W81-04421

HEAVY METALS IN THE RUHR RIVER AND THEIR BUDGET IN THE CATCHMENT AREA,
Ruhrverband, Essen (Germany, F.R.).
K. R. Imhoff, P. Koppe, and F. Dietz.
Water Science and Technology, Vol 13, No 1, p Tor 735-749, 1981. 8 Fig, 5 Tab, 16 Ref.

Descriptors: *Heavy metals, *Ruhr River, Lead, Copper, Zinc, Nickel, Chromium, Cadmium, *Industrial wastes, Waste water composition, Waste water pollution, Path of pollutants.

The concentration of heavy metals in rivers, waste water and potable water was studied in the entire Ruhr catchment area over an 8 yr program. Almost 55% of the heavy metals in the Ruhr River were discharged initially from municipal and industrial waste water treatment plants. Geochemical origins account for another 45%. The municipal treatment plants receive 31% of the heavy metals from domestic and 69% from industrial waste waters. The fractions for specific metals vary considerably. For chromium, 90% is discharged by industry. Corresponding figures for nickel and cadmium and for copper and zinc are 65% and 50%, respectively. From results of 19 plants receiving only domestic waste water, the heavy metal contribution of the population was calulated. About 40% of the total heavy metal load of the Ruhr River is deposited in the sediments of four impounding lakes in the middle and the lower Ruhr. A topological progression for the relationship between heavy metal concentration in sediments and decrease of metal concentration in river water is described, which indicates a decreasing fixation of metals in the sediment. (Baker-FRCL)
W81-04430

NONPOINT SOURCE QUANTIFICATION AND ITS ROLE IN LAKE AND STREAM WATER QUALITY PLANNING,
Center for the Environment and Man, Inc., Hartford, CT. Div. of Environment Systems.
For primary bibliographic entry see Field 6A.
W81-04433

SANITARY LANDFILLS,
Southwest and Texas Water Works Journal, Vol 62, No 12, p 8-9, 11-12, March, 1981. 5 Fig, 6 Ref.

Descriptors: Disposal, *Leachate, Landfills, *Path of pollutants, Ultimate disposal, *Waste disposal, Solid wastes, Garbage dumps, Soil chemistry, Water pollution sources, Permeability, Metals, Organic compounds, Inorganic compounds, *Sanitary landfills.

The effects of sanitary landfills on groundwater quality depend on several factors, such as the quality, composition and movement of leachate. Whenever the waste liquid plus rainfall rate exceeds the evapotranspiration rate plus the capacity of soil and waste to absorb liquid, leachate is generated. The fate of each component in the landfill is different. Organic materials do not degrade significantly once they reach the groundwater because of anaerobic conditions and cool temperatures. Many microorganisms are killed by decomposition temperatures up to 152F; those surviving generally die before the leachate travels 100 feet through any but the coarsest soil. Inorganic materials, consisting of metallic ions, chlorides, sulfates, etc., are predominantly removed by adsorption and chemical precipitation. Any adsorbed or precipitated materials may redissolve with changes in pH. Study of a 20-year old Florida landfill not properly operated showed that leachate had contaminated nearby wells. Two alternatives were proposed; both involved drilling wells in the leachate plume and removing contaminated water to the surface for disposal. Alternatives to sanitary landfills are balefill (compacting wastes into bales before placement in the fill) and resource recovery. (Cassar-FRC)
W81-04441

METHYLMERCURY PRODUCTION IN THE MARINE WATER COLUMN,
Department of Agriculture and Fisheries for Scotland, Aberdeen.
G. Topping, and I. M. Davies.
Nature, Vol 290, No 5803, p 243-244, March 19, 1981. 1 Fig, 17 Ref.

Descriptors: *Mercury, *Methyl mercury, *Sediments, *Sea water, Phytoplankton, Path of pollutants, Water pollution sources, Heavy metals, Metals, Chemical properties, Aquatic life, Biotransformation.

Biosynthesis of methylmercury in sediments is well established, but evidence was previously lacking on methyl mercury formation in the marine water column. A natural population of plankton was maintained in a large plastic bag moored in an arm of Loch Ewe, Scotland. Water was spiked with HgCl2 at 0.5 micrograms per dm. Although no natural sediment was present, significant quantities of methyl mercury (1-10 micrograms per day) were found in the material settling from the water. The debris was removed every 24 hours. Experimental results were used to calculate the ratio of methyl mercury in micrograms to carbon in grams (1.23) and the ratio of methyl mercury in micrograms to total mercury in micrograms (0.0088). Estimations of methyl mercury concentrations in open ocean water were 121,000 tons, with 492 tons per year formed in association with carbon fixation. Total methyl mercury in marine sediments was calculated at 16,200 tons, produced at the rate of 450 tons per year. (Cassar-FRC)
W81-04460

IXTOC 1 OIL SPILL: FLAKING OF SURFACE MOUSSE IN THE GULF OF MEXICO,
Georgia Univ., Athens. Dept. of Microbiology.
J. S. Patton, M. W. Rigler, P. D. Boehm, and D. L. Feist.
Nature, Vol 290, No 5803, p 235-238, March 19, 1981. 3 Fig, 1 Tab, 27 Ref.

Descriptors: *Oil pollution, *Oil spils, *Degradation, *Organic compounds, Path of pollutants, Water pollution sources, Disasters, Oil wells, Aromatic compounds, Ixtoc, Gulf of Mexico, Mousse.

Pelagic weathering of oil spilled into the Gulf of Mexico by the Ixtoc offshore oil rig produced macroscopic decomposition products in 4 forms: pancakes, skin, flakes, and surface sheen. The floating mousse (a light brown and orange water-in-oil emulsion) dispersed in the sea, forming pancake, which shed milligram-weight flakes from the surface of the cracked, scaly crust. The flaking process exposed fresh mousse, from which oil emanated, creating a surface sheen, until a skin formed on the pancake. Further agitation broke the skin, producing new flakes. Microbial degradation was not directly involved in the decomposition process. Chemical compositions of the different forms were: flakes-47.5%, aliphatic, 20.8% aromatic, and 31.7% polars; pancakes--57.6% aliphatics, 22.1% aromatics, 20.2% polars; skin--50.6% aliphatics, 19.6% aromatics, 30.4% polars; and wellhead emulsion--49.3% aliphatics, 42.6% aromatics, 8.1% polars. (Cassar-FRC)
W81-04462

ANNUAL LAMINATIONS IN THE SEDIMENTS OF LOE POOL, CORNWALL,
Joensuu Univ. (Finland). Karelian Inst.
H. L. K. Simola, M. A. Coard, and P. E. O'Sullivan.
Nature, Vol 290, No 5803, p 238-241, March 19, 1981. 5 Fig, 29 Ref.

Descriptors: *Lakes, *Algae, *Sediments, *Mine wastes, Tin mining, Laminations, Cores, Sampling, Seasonal, Great Britain, Path of pollutants, Water pollution sources, Sedimentology.

Annually laminated sediments were dicovered in Loe Pool, Cornwall, Great Britain. This 44 hectare, 4 meter deep eutrophic freshwater lagoon is located in a region where extensive tin mining was conducted during the 19th and early 20th centuries. The first 5 cm of sediment cores revealed bands of algal taxa corresponding to seasonal and annual variations. Between 5 and 40 cm (deposition dates 1975 to 1938) considerable bioturbation had occurred in the sediments. The 40-120 cm section, composed of irregularly laminated sequences of red and gray clays alternating with darker layers, covers a period of only 7 years, deposited within the era of heavy mining activity between 1920 and 1938. The 120-300 cm layer, laid down during a period of less intensive mining starting about 1870, is comprised of regularly laminated sediment consisting of paired gray and black layers, averaging 3 cm thick per pair. During this time mining wastes flowed into the lake steadily during the winter. (Cassar-FRC)
W81-04463

TRACE ELEMENTS IN MYTILUS EDULIS L. FROM THE ESTUARY AND GULF OF ST. LAWRENCE, CANADA: LEAD AND CADMIUM CONCENTRATIONS,
Institut National de la Recherche Scientifique, Rimouski (Quebec). Lab. Oceanographique.
For primary bibliographic entry see Field 2L.
W81-04474

LAKE ERIE NUTRIENT CONTROL ASSESSMENT: AN OVERVIEW OF THE STUDY,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
For primary bibliographic entry see Field 5G.
W81-04476

PHOSPHORUS BUDGET OF THE CENTRAL AND WESTERN BASINS OF LAKE ERIE: 1973-1975,
Ohio State Univ., Columbus. Dept. of Chemical Engineering.
K. Svanka, and D. E. Rathke.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-107070, Price codes: A17 in paper copy, A01 in microfiche. In: Lake Erie Nutrient Control Program: An Assessment of Its Effectiveness in Controlling Lake Eutrophication, Environmental Protection Agency Report EPA-600/3-80-062, July 1980. p 131-174, 4 Fig, 26 Tab, 2 Ref.

Descriptors: *Phosphorus, *Phosphorus removal, *Lake basins, Sedimentation rates, Mass transfer, Anaerobic conditions, Sinks, Nutrients, Pollutants, Cycling nutrients, Lake Erie basin.

The phosphorus budget was determined by field loadings and estimated loadings for April-December, 1973-1975. The western basin was divided into seven grid areas, and the central basin into 25 and measurements were taken at stations within each grid. In 1975 the western basin's phosphorus input was 8527 metric tons, the loss to the central basin was 4000 metric tons, the net settling was 5031 metric tons with a retention rate of 53.09%. The central basin's inputs were 4000 metric tons from the western basin, 1131 metric tons from point sources and 469 metric tons from diffuse sources; loss to eastern basin was 2060 metric tons, net settling was 1019 metric tons with a retention rate of 63.21%. These figures and those for 1974 show no significant changes in concentration and quantity of phosphorus in either basin compared with results from 1970. Resuspension appears to be the

major source of internal phosphorus loading. Anoxic regeneration of phosphorus was considered of secondary importance as a source of internal loading and only contributed during the late summer in the central basin. During 1970-1975, both basins served as phosphorus sink. (Brambley-SRC)
W81-04481

MONITORING WELL SAMPLING AND PRESERVATION TECHNIQUES,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 7B.
W81-04487

INTERPRETING RESULTS FROM SERIAL BATCH EXTRACTION TESTS OF WASTES AND SOILS,
Dugway Proving Ground, UT.
M. J. Houle, and D. E. Long.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-175086, Price codes: A13 in paper copy, A01 in microfiche. In: Disposal of Hazardous Waste; Proceedings of the Sixth Annual Research Symposium, March 17-20, 1980, Chicago, Illinois. Environmental Protection Agency Report EPA-600/9-80-010, March 1980. p 60-81, 13 Fig, 7 Tab, 14 Ref. EPA-IAG-04-0443.

Descriptors: *Leaching, *Industrial wastes, *Soil properties, *Groundwater pollution, Adsorption, Permeability, Testing procedures, Leachates, Hazardous materials, Prediction.

It has been established that a graded serial batch extraction method is very useful for studying the leachability of industrial wastes and for determining the retention characteristics of soils. Extractions were conducted with a hydrofluoric acid production waste and a secondary zinc smelter sludge with a clay soil, and the results used to calculate the weight of substance leached from waste, and penetrating and retained on soil, the penetration factors, and distribution coefficients. The extractions of fluorine from the hydrofluoric acid waste and cadmium from the zinc sludge are presented histographically. The histograms correlate well with the results obtained from continuous column leaching studies. Because of this correlation, the much less time-consuming batch tests may be substituted for continuous testing in investigating changes in waste and soil as leaching progresses. They provide information only for saturated transport models, and assume a uniformly-packed bed of soil, and lack of effect on flow by leachate-soil interactions, but provide data suited for predicting the movement of hazardous substances through soil. (Brambley-SRC)
W81-04489

DISPOSAL AND REMOVAL OF HALOGENATED HYDROCARBONS IN SOILS,
Illinois State Geological Survey, Urbana.
R. A. Griffin, and S-F. J. Chou.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-175086, Price codes: A13 in paper copy, A01 in microfiche. In: Disposal of Hazardous Waste; Proceedings of the Sixth Annual Research Symposium, March 17-20, 1980, Chicago, Illinois. Environmental Protection Agency Report EPA-600/9-80-010, March, 1980. p 82-92, 3 Fig, 7 Tab, 46 Ref.

Descriptors: *Benzenes, *Chlorinated hydrocarbons, *Halogenated hydrocarbons, *Leaching, *Adsorption, Solubility, Organic solvents, Organic carbon, Degradation, Hexachlorobenzene, Polybrominated biphenyls, Landfills, Soil types.

The adsorption, mobility, and degradation of polybrominated biphenyls (PBBs) and hexachlorobenzene (HCB) in soil materials and in a carbonaceous adsorbent were studied, together with the solubilities of PBBs abnd HCB in waters and landfill leachates. The aqueous solubilities of both materials were low (16 ppb), but solubilities were higher in river water and landfill leachate than in distilled water. The solubilities can be directly correlated with the level of dissolved organics in the waters. By using a soil thin-layer chromatography technique, it was found the PBBs and HCB were immobile in all soils when leached with deionized water and landfill leachate; they were highly mobile in all soil materials when leached with organic solvents (ethanol, hexane, ethyl acetate or ethyl dichloride). Freundlich adsorption isotherm plots of PBBs HCB sorption on soils and on a carbonaceous adsorbent yielded straight and nearly parallel lines. All regression lines generated had a coefficient of at least 0.98, which indicated an excellent fit of the data to the Freundlich equation. PBBs and HCB were strongly adsorbed by the carbonaceous adsorbent and by soil materials, with HCB being adsorbed to a greater extent than PBBs. The adsorption capacity and mobility of PBBs and HCB were highly correlated with the organic carbon content of the soil materials. In a soil incubation study, it was found that PBBs and HCB persisted for 6 months in soil with no significant microbial degradation. Because of their low water solubilities, strong adsorption, and persistence in soils, these two compounds are highly resistant to aqueous phase mobility through earth materials; however, they are highly mobile in organic solvents. (Brambley-SRC)
W81-04490

MOVEMENT AND BIOLOGICAL DEGRADATION OF LARGE CONCENTRATIONS OF SELECTED PESTICIDES IN SOILS,
Florida Univ., Gainesville. Dept. of Soil Science.
J. M. Davidson, P. S. C. Rao, and L. T. Ou.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-175086, Price codes: A13 in paper copy, A01 in microfiche. In: Disposal of Hazardous Waste; Proceedings of the Sixth Annual Research Symposium, March 17-20, 1980, Chicago, Illinois. Environmental Protection Agency Report EPA-600/9-80-010, March, 1980. p 93-107, 3 Fig, 4 Tab, 42 Ref.

Descriptors: *Pesticides, *Microbial degradation, *Adsorption, *Leaching, Metabolism, Metabolites, Atrazine, Methyl parathion, Terbacil, Trifluralin, 2,4-D, Path of pollutants, Soil types.

Equilibrium adsorption isotherms of the non-linear Freundlich type were obtained for atrazine, methyl parathion, terbacil, trifluralin, and 2,4-D and four soils. Pesticide solution concentrations used in the study ranged from zero to the aqueous solubility limit of each pesticide. The mobility of each pesticide increased as the concentration of the pesticide in the soil solution phase increased. These results were in agreement with the equilibrium adsorption isotherm data. Biological degradation of each pesticide was measured by carbon-14 carbon dioxide evolution resulting from the oxidation of uniformly ring-labeled pesticides, except trifluralin which was labeled at C-l. Technical grade and formulated forms of each pesticide at concentrations ranging from zero to 20,000 microgram of soil were used in the biological degradation experiments. Pesticide degradation rates and soil microbial populations generally declined as the pesticide concentration in the soil increased; however, some soils were able to degrade a pesticide at all concentrations studied, some soils degraded a pesticide at a low concentration but not a higher concentration, while others remained essentially sterile throughout the incubation period. Total carbon dioxide evolution was not always a good indication of pesticide degradation. Several pesticide metabolites were formed and identified in various soil-pesticide systems. The quantities of methly parathion, trifluralin and atrazine 'bound' to the soil at the end of the incubation period were measured and in some cases appeared to be related to types of metabolites formed during biological degradation.
W81-04491

INFLUENCE OF LEACHATE QUALITY ON SOIL ATTENUATION OF METALS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
W. H. Fuller, A. Amoozegar-Fard, E. E. Niebla, and M. Boyle.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-175086, Price codes: A13 in paper copy, A01 in microfiche. In: Disposal of Hazardous Waste; Proceedings of the Sixth Annual Research Symposium, March 17-20, 1980, Chicago, Illinois. Environmental Protection Agency Report EPA-600/9-80-010, March, 1980. p 108-117, 6 Fig, 8 Tab, 17 Ref.

Descriptors: *Leachates, *Leaching, *Heavy metals, *Groundwater pollution, Municipal wastes, Industrial wastes, Cadmium, Soil types, Percolation rate, Prediction, Landfills.

The rate of movement through soil of constituents in waste leachates, whether from municipal solid waste (MSW) or industrial wastes depends on the nature of: the porous medium through which solutions move (soil, geologic debris, clays); the vehicle transporting the constituent (leachate); and the potential pollutant constituent itself (Cd, Fe, Ni and Zn). This presentation is concerned with the rate of movement of Cd, Fe, Ni, and Zn as correlated with certain measurable broad parameters of MSW landfill leachates. The most prominent, readily measurable parameters have been identified as total organic carbon, pH, concentration of soluble common salts, and Fe. All the leachate factors directly influenced the migration rate of cadmium through six soils. Equations are presented to calculate the apparent cadmium velocity through the soil, from which the time for cadmium to reach the groundwater can be calculated for field situations. The equations can also be used to obtain breakthrough curves at any depth within the profile. (Brambley-SRC)
W81-04492

FIELD INVESTIGATION OF CONTAMINANT LOSS FROM CHEMICALLY STABILIZED SLUDGES,
Army Engineer Waterways Experiment Station, Vicksburg, MA.
L. W. Jones, P. G. Malone, and T. E. Myers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-175086, Price codes: A13 in paper copy, A01 in microfiche. In: Disposal of Hazardous Waste; Proceedings of the Sixth Annual Research Symposium, March 17-20, 1980, Chicago, Illinois. Environmental Protection Agency Report EPA-600/9-80-010, Mar 1980. p 187-202, 4 Fig, 13 Tab, 7 Ref. EPA-IAG-D4-0569.

Descriptors: *Leaching, *Industrial wastes, *Landfills, *Soil contamination, *Sludge disposal, Metals, Heavy metals, Electroplating, Metal finishing wastes, Oil wastes, Statistical analysis.

The movement of contaminants from treated industrial sludges placed at four disposal sites was examined. Test borings were made through the treated sludges into the soil beneath and into surrounding, uncontaminated soils. Measurements of selected chemical constituents in nitric acid digests from shallow soil samples collected immediately below the treated sludges and from soil samples collected at comparable elevations in surrounding soils were compared using the Mann-Whitney U Test. Soils beneath treated auto assembly wastes disposed at two locations showed elevated levels of manganese, sodium, and selenium. Soils beneath treated electroplating waste showed elevated levels of iron, sodium, mercury, and nickel. At one location where treated oil refinery waste was disposed no significant soil contamination was detected. Even in contaminated soils the levels of constituents determined were well within the ranges reported for natural soils. However, the treated waste had been in place only 3-4 yr at the sites studied, and the site with no significant soil contamination was covered with a 0.5 m layer of clay. (Brambley-SRC)
W81-04498

LEACHATE FROM MUNICIPAL AND INDUSTRIAL WASTE LANDFILL SIMULATORS,
Cincinnati Univ., OH.
R. N. Kinman, and J. J. Walsh.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-175086, Price codes: copy, A01 in microfiche. In: Disposal of Hazardous Waste; Proceedings of the Sixth Annual Research Symposium, March 17-20, 1980,

Chicago, Illinois. Environmental Protection Agency Report EPA-600/9-80-010, March, 1980. p 203-222, 33 Fig, 5 Tab, 4 Ref.

Descriptors: *Leachates, *Municipal wastes, *Industrial wastes, *Landfills, *Simulation, Infiltration rate, Sewage sludge, Wetting, Gases, Heavy metals, Hydrogen ion concentration, Organic carbon, Chemical oxygen demand, Nitrogen.

In late 1974, a simulated landfill study was initiated to study landfill behavior under controlled conditions. A total of 19 test cells were constructed to study different infiltration rates, pH buffering compounds, prewetting the wastes and co-disposing refuse with sewage sludge and various industrial wastes. Each cell received approximately 3.2 metric tons of municipal refuse. Twelve received municipal refuse plus small quantities of industrial wastes and other materials. Water additions were made on all cells on a preset schedule to approximate Midwest U.S. infiltration rates. Quality and quantity data were collected on leachate and gas produced. Data collected from leachate and gas analysis for the cells which contained municipal refuse plus industrial wastes encompassing the period from November, 1974 to August, 1978 are reported. The effects of the addition of sewage sludge; calcium carbonate; petroleum, chlorine production brine and solvent based paint sludges; and battery, electroplating, and inorganic pigment wastes on 14 leachate parameters and gas quantity and volume are reported. The leachate parameters are: pH, alkalinity, total solids, TOC, COD, total Kjeldahl nitrogen, Fe, Cu, Cr, Pb, Ni, Cd, Zn, and Hg. (Brambley-SRC)
W81-04499

CHEMICALLY STABILIZED INDUSTRIAL WASTES IN A SANITARY LANDFILL ENVIRONMENT,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
T. E. Myers, N. R. Francingues, D. W. Thompson, and P. G. Malone.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-175086, Price codes: A13 in paper copy, A01 in microfiche. In: Disposal of Hazardous Waste; Proceedings of the Sixth Annual Research Symposium, March 17-20, 1980, Chicago, IL. EPA Rept. EPA-600/9-80-010, Mar 1980. p 223-241, 12 Fig, 8 Tab, 12 Ref. EPA-IAG-D4-0569.

Descriptors: *Industrial wastes, *Leachates, *Simulation, *Landfills, *Municipal wastes, Metals, Heavy metals, Chemical wastes, Chemical treatment, Sewage sludge, Chemical composition, Sludge.

Simulation of the co-disposal of municipal solid waste (MSW) with untreated industrial waste and with chemically stabilized industrial wastes in large-scale test cells was initiated in April 1978. Simulations were conducted in 1.83 x 3.66 m cylindrial test cells designed to simulate sanitary landfill environments. Three industrial wastes were chemically stabilized by two commercially available processes. The three types of industrial wastes were electroplating sludge, chlorine production brine sludge, and calcium fluoride/sewage sludge. All test cells received deionized water equivalent to an infiltration rate of 66 cm per year. Leachate samples were collected and analyzed for 10 parameters on a monthly basis and extensive chemical characterization of leachates for 17 metals was conducted on a quarterly basis. Results of these analyses for the first 9 months of leachate production are compared with control test cells containing MSW only. Release of toxic metals (Al, Cd, Cu, Hg, Na) from untreated chlorine production brine sludge co-disposed with MSW was observed, however, chemical stabilization significantly reduced the leaching of toxic metals (Cd, Hg, Cr) from the co-disposed chlorine production brine sludge. The co-disposal of treated or untreated electroplating sludge with MSW did not affect typical leachate quality. The co-disposal of MSW with calcium fluoride/sewage sludge apparently improved leachate quality.
W81-04500

STABILIZATION AT MUNICIPAL LANDFILLS CONTAINING INDUSTRIAL WASTES,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
F. G. Pohland, and J. P. Gould.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-175086, Price codes: A13 in paper copy, A01 in microfiche. In: Disposal of Hazardous Waste; Proceedings of the Sixth Annual Research Symposium, March 17-20, 1980, Chicago, Illinois. Environmental Protection Agency Report EPA-600/9-80-010, March, 1980. p 242-253, 5 Fig, 5 Tab, 9 Ref.

Descriptors: *Municipal wastes, *Industrial wastes, *Landfills, *Lysimeters, *Heavy metals, *Leachates, Chemical reactions, Biochemistry, Oxidation-reduction potential, Hydrogen ion concentration, Sulfides, Water pollution prevention, Regulations, Sludge.

The technical feasibility and merit of codisposal of municipal and industrial wastes in landfills are discussed with specific emphasis on the fate of heavy metals under the influence of leachate containment, collection and recycle. The results of both pilot-scale and lysimeter-type landfill investigations are utilized to describe prominent biochemical and physical-chemical phenomena within the landfill environment, to illustrate probable reaction mechanisms, to develop a control strategy and to indicate a need for some flexibility in regulations governing landfill management options. Utilizing residential-type solid wastes alone and in conjunction with a metal plating sludge, data have indicated the possibility for significant reductions in leachate heavy metal concentrations and the key roles of redox potential, pH and sulfides, hydroxides and hydroxy-carbonates in sequestering metals. Present studies are being extended to determine limits of heavy metal loadings that can be sustained during codisposal without deleterious effects on the biochemical processes of stabilization within the landfill, and/or the identity of internally produced or externally added mediators which are capable of minimizing these effects.
W81-04502

AGRICULTURAL LAND USE WATER QUALITY INTERACTION: PROBLEM ABATEMENT, PROJECT MONITORING, AND MONITORING STRATEGIES,
Meta Systems, Inc., Cambridge, MA.
J. Kuhner.
Environmental Protection Agency Report, September, 1980. 76 p, 8 Fig, 18 Tab, 17 Ref.

Descriptors: *Water quality, *Agricultural runoff, *Agriculture, *Water pollution prevention, *Land use, *Monitoring, Nonpoint pollution sources, Sedimentation, Eutrophication, Salinity, Pesticides, Pathogens, Organic matter, Nitrates.

An attempt was made to generalize agriculturally related nonpoint source pollution problems in various receiving waters and outline their potential remedies through modification of practices and introduction of new ones. The land uses selected were cropland, orchard/vineyard, grazing land, animal holding, and homestead, the receiving waters selected were lake/reservoir, small stream, river, bays (Great Lakes), and groundwater; and the water quality problems and their indicators were sedimentation, eutrophication, salinity, pesticides, pathogens, BOD/organic materials, and nitrates. Pollutants may reach the receiving water by runoff, percolation or transport by sediment. The major water quality impacts of each land use on each water type are tabulated, and control methods are listed. The control methods can be categorized into five types: modification of land use activities without any additional structures; management strategies; on-site structures attached to/associated with land use activities; off-site structures capturing and/or modifying runoff and washoff; and streambank and instream control measures. Water quality considerations must be the driving force behind the selection of Best Management Practices. Background water quality data are not essential in the selection of a monitoring/evaluation project, but all monitoring must be preceded by analyses to determine the pathways of pollution and the frequency and location of monitoring. (Brambley-SRC)
W81-04505

RADIOCHEMICAL STUDIES OF THE LEACHING OF METAL IONS FROM SLUDGE BEARING CONCRETE,
Manhattan Coll., Bronx, NY. Dept. of Chemistry.
For primary bibliographic entry see Field 5E.
W81-04508

GEOCHEMICAL DISTRIBUTION OF TRACE METALS AND ORGANOCHLORINE CONTAMINANTS OF A LAKE ONTARIO SHORELINE MARSH,
National Water Research Inst., Burlington (Ontario). Aquatic Ecology Div.
W. A. Glooschenko, J. Capocianco, J. Coburn, and V. Glooschenko.
Water, Air, and Soil Pollution, Vol 15, No 2, p 197-213, 1981. 6 Fig, 7 Tab, 32 Ref.

Descriptors: *Path of pollutants, *Chlorinated hydrocarbons, *Heavy metals, Sediment transport, Pesticides, Sediments, DDT, DDE, DDD, Chlordane, Polychlorinated biphenyls, Mirex, Hexachlorobenzene, Marshes, Nutrients, Sediments, Supended sediments, Lakes, *Lake Ontario, Geochemistry, Lake shores.

A sedimentary geochemistry study was conducted on the Lake Ontario shoreline as part of a water quality study on the suburban marsh of Rattray. The distributions of nutrients an potential trace metal and organochlorine pollutants in marsh sediments were studied with the aid of computer analysis. Sediment concentrations of Cu, Zn, Pb and Hg were generally higher than in local soils, but lower than those from recent sediments of Lake Ontario. About a two-fold increase was observed in the sedimentary levels of Cu, Zn, Co, Cr and Ni over the past 100 years, while levels of Cd increased four-fold and Pb, eight-fold. Factor analysis of geochemical data and higher metal levels in marsh areas subjected to sediment deposition showed that the metals were most probably associated with silts and clays. Analysis of a suspended sediment sample from Sheridan Creek, the main tributary of the marsh, also indicated that the metals were transported in silts and clays. Organochlorine levels showed a distribution pattern similar to that of the trace elements. Major organochlorine contaminants present in surficial sediment samples included DDE, DDT, TDE, chlordane, PCB, mirex and hexachlorobenzene. (Geiger-FRC)
W81-04535

ACIDITY AND CONDUCTIVITY OF PRECIPITATION ON CENTRAL LONG ISLAND, NEW YORK, IN RELATION TO METEOROLOGICAL VARIABLES,
Brookhaven National Lab., Upton, NY. Dept. of Energy and Environment.
G. S. Raynor, and J. V. Hayes.
Water, Air, and Soil Pollution, Vol 15, No 2, p 229-245, 1981. 4 Fig, 4 Tab, 31 Ref.

Descriptors: *Precipitation, *Hydrogen ion concentration, *Conductivity, Acidic water, Sulfates, Meteorological data, Path of pollutants, Nitrates, Nitrites, Ammonium compounds, Sodium, Chlorides, New York, Rain water, *Long Island.

Hydrogen ion concentrations of precipitation samples collected hourly for three years starting June 1976 at central Long Island, New York, correlated well with sulfate ion concentrations and, to a lesser extent, with nitrogen in nitrate plus nitrite and nitrogen in ammonium ion. The hydrogen ion contributed the most to conductivity, sulfate second; nitrate, nitrite, ammonium chloride, and sodium to a lesser degree. Conductivity calculated from separate chloride, and sodium to a lesser degree. Conductivity calculated frm separate ions agreed well with measured conductivity. Acidity was highest in summer (20-30); with cold front and squall line precipitation; rainshowers, and thundershowers; with precipitation rates greater than 12.0 mm per hour; and with west, northwest, and southwest winds. Relationships between conductivity and

meteorological data were similar to those of hydrogen ion concentration except when sodium and chloride predominated. Hydrogen ion concentrations were similar to other locations throughout the northwestern United States. In this study, precipitation pH values ranged from 3.21 to 7.0, mean 4.34. (Cassar-FRC)
W81-04536

ATRAZINE RESIDUES IN ESTUARINE WATER AND THE AERIAL DEPOSITION OF ATRAZINE INTO RHODE RIVER, MARYLAND,
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
T. L. Wu.
Water, Air, and Soil Pollution, Vol 15, No 2, p 173-184, 1981. 6 Fig, 24 Ref.

Descriptors: *Estuarine environment, *Herbicides, Air pollution, Air-water interfaces, *Rhode River, Chesapeake Bay, Atrazine, Maryland.

Results on a two year study of the atmospheric input of atrazine and the distribution of atrazine in estuarine water of the Rhode River, an arm of the Chesapeake Bay, are presented. Estuarine water samples were collected from a mud flat station near the head of the Rhode River. Rainwater samples were collected on top of a tall building at the Chesapeake Bay Center for Environmental Studies. Atrazine residues were detectable in estuarine water and rainwater year round. In estuarine water residues ranged from 6 to 190 ng/l. Rainwater values were from 3 to 2190 ng/l. Intermittent spraying operations of atrazine within the cornfields are generally done during May each year. Rain samples collected during May of 1978 showed higher atrazine residues than during the rest of the 1978 growing season. A decline in atrazine concentrations in estuarine water was noted in October and November, which continued until a rainfall following spring herbicide applications. It was concluded, however, that direct atmospheric input of atrazine did not seem to contribute significantly to the enrichment mechanism. The estuarine microsurface layer could be a source of atmospheric atrazine, but the important of this source has yet to be determined. (Baker-FRC)
W81-04537

FATE OF THE BENZENE RING OF LINEAR ALKYLBENZENE SULFONATE IN NATURAL WATERS,
Procter and Gamble Co., Cincinnati, OH.
R. J. Larson, and A. G. Payne.
Applied and Environmental Microbiology, Vol 41, No 3, p 621-627, March, 1981. 3 Fig, 4 Tab, 15 Ref.

Descriptors: *Degradation, *Alkylbenzene sulfonates, *Detergents, Linear alkylate sulfonates, Biodegradation, Sulfonates, Microbial degradation, Rivers, Sediments, Path of pollutants, Aromatic compounds, Organic compounds, Sulfonates, Waste water treatment, Effluents.

The biodegradability of linear alkylbenzene sulfonate (LAS) at concentrations of 50 to 500 micrograms per liter was studied in water and/or sediment samples from a river receiving discharge from a municipal waste water treatment plant. Rates of primary degradation were determined by a modified methylene blue active substance method, and rates of ultimate degradation, by using a C-12 (twelve-carbon) analog uniformly labeled with C-14 in the benzene ring. Samples of water containing sediment collected below the plant showed an estimated half life for LAS of 0.23 days for the first stage of degradation and a half life of 0.73 days for the benzene ring mineralization. The benzene ring degraded more slowly (half life 1.4 to 14 days) in water containing no sediments and in water and sediments collected upstream of the treatment plant. LAS was poorly sorbed to river sediments. The C-14 activity was found in the biomass. At concentrations of LAS between 10 and 20 mg per liter, microbial degradation is hampered, and at concentrations greater than 20 mg per liter, totally inhibited. (Cassar-FRC)
W81-04539

IODINE-131 LEVELS IN SLUDGE AND TREATED MUNICIPAL WASTE WATERS NEAR A LARGE MEDICAL COMPLEX,
Texas Univ. Health Science Center at Houston. School of Public Health.
H. M. Prichard, T. F. Gesell, and E. Davis.
American Journal of Public Health, Vol 71, No 1, p 47-52, January, 1981. 6 Fig, 1 Tab, 12 Ref.

Descriptors: *Radioactive wastes, *Iodine radioisotopes, *Hospitals, Nuclear wastes, Radionuclides, Public health, Shellfish, Waste water treatment, Sewage effluents, Sludge disposal, Soil amendments, Effluents, Path of pollutants, Water pollution, Waste disposal.

Iodine-131 was found in dried sludge and concentrated liquid effluent samples from a sewage treatment plant serving the area containing the Texas Medical Center, Houston, in 1975. Although the concentration of I-131 varied from week to week, partitioning between dried sludge and liquid effluent was fairly constant, 1:4.3. The average daily discharge was 4.4 mCi of I-131; calculated annual discharge, 1.6 Ci. Since the effluent from this system is discharged into a saline water system, there is no danger at present of contaminating drinking water with low level radiation. Oysters collected downstream showed no evidence of I-131. Although the dried sludge is used as a soil amendment, the processing time and time until crop harvest greatly exceeds the 8-day half-life of I-131. Caution is indicated if sewage effluent containing radionuclides is discharged into a fresh water system or if edible marine animals are harvested further upstream. The authors suggest a lack of consistency in nuclear regulatory philosophy when the same nuclides are regulated for the power industry and not for medicine. One procedure to reduce exposure is retaining patient excreta to permit isotope decay before discharging into the treatment system. (Cassar-FRC)
W81-04543

ACCUMULATION OF ZINC, CADMIUM, AND LEAD BY FIELD POPULATIONS OF LEMANEA,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 5A.
W81-04550

INTERACTION AND MOBILITY OF COBALT-60 BETWEEN WATER AND SEDIMENTS IN MARINE ENVIRONMENTS. POSSIBLE EFFECTS BY ACID RAIN,
National Research Council of Canada, Ottawa (Ontario). Div. of Biological Sciences.
Y. Mahara, and A. Kudo.
Water Research, Vol 15, No 4, p 413-419, April, 1981. 6 Fig, 1 Tab, 17 Ref.

Descriptors: *Marine sediments, *Radioactive waste disposal, *Acid rain, *Cobalt radioisotopes, Seawater, *Japan, Path of pollutants, Sediments, Marine environment, Adsorption, Radioactive wastes, Hydrogen ion concentration, Fate of pollutants.

All of the nuclear power plants in Japan have been constructed on seashores, and radioactive wastes are either stored on site or discharged into marine environments. The interaction between radioactive cobalt (60Co), water and sediments was investigated with the purpose of finding a difference in behavior of this cobalt species in freshwater and seawater. Cobalt persisted in the water phase in marine environments more than 5 times as long as it did in freshwater under natural conditions. Over 95% of the cobalt in freshwater was adsorbed by and permanently retained within the bed sediments. In the marine environment, cobalt became increasingly moble, depending upon such factors as pH, redox potential, ionic strength, sediment type, and reaction time. In order to reduce the mobility of radioactive cobalt wastes, it was suggested that the treatment and storage of nuclear wastes be conducted in freshwater, rather than in marine environments. Because of its pH dependence, the mobility of 60Co in aquatic environments is expected to be strongly affected by acid rain. (Geiger-FRC)
W81-04554

HEAVY METALS IN MERCENARIA MERCENARIA AND SEDIMENTS FROM THE NEW BEDFORD HARBOR REGION OF BUZZARD'S BAY, MASSACHUSETTS,
Southeastern Massachusetts Univ., Nort Dartmouth, MA.
P. E. Genest, and W. I. Hatch.
Bulletin of Environmental Contamination and Toxicology, Vol 26, No 1, p124-130, 1981. 1 Fig, 1 Tab, 31 Ref.

Descriptors: *Heavy metals, *Industrial wastes, *Harbors, Mollusks, Water pollution effects, Bottom sediments, *New Bedford Harbor, Massachusetts.

The distribution and accumulation of metals in bivalves was studied in the New Bedford, Massachusetts area, because of the existence of manufacturing facilities using metals and the importance of local fishing. M. mercenaria and sediments from the region were analyzed for cadmium, copper, iron, lead, and zinc. Cadmium content of the sediments did not vary significantly with either season or site. Copper, iron, and lead concentrations did not vary throughout the year but were site dependent. Zinc concentrations were site dependent and seasonal. All tissue metal concentrations varied significantly with season. Iron concentrations varied between sites, and lead was site dependent. A high correlation between all metals in the sediment suggested that the sources of the metals are closely related and probably of industrial origin. The tissue levels of the five metals were within safe limits in terms of public health, even though copper approached the limit set in Australia. Future monitoring of the metal situation in the harbor is needed. (Small-FRC)
W81-04566

ACCUMULATION AND ELIMINATION OF RADIOACTIVITY IN THE NORWAY LOBSTER (NEPHROPS NORVEGICUS) FOLLOWING INTRAGASTRIC ADMINISTRATION OF (9-14C)PHENANTHRENE,
Institute of Marine Research, Bergen (Norway).
For primary bibliographic entry see Field 5C.
W81-04567

DISTRIBUTION AND ELIMINATION OF (9-14C) PHENANTHRENE IN THE HORSE MUSSEL (MODIOLA MODIOLUS).
Institute of Marine Research, Bergen (Norway).
K. H. Palmork, and J. E. Solbakken.
Bulletin of Environmental Contamination and Toxicology, Vol 26, No 2, p 196-201, 1981. 2 Tab, 11 Ref.

Descriptors: *Mussels, *Organic compounds, Hydrocarbons, Distribution, Phenanthrene, Metabolism, *Path of pollutants, Laboratory studies, Radioactive tracers.

Previous studies reported the presence of polycyclic aromatic hydrocarbons (PAH) in mussels from fjords polluted by discharges from industries using Soderberg electrodes. To study PAH metabolism in molluscs, horse mussels (Modiola modiolus) were collected in a non-polluted area near Bergen. 9-14C-labeled phenanthrene was mixed with seawater, and placed in three tanks containing ten mussels each. After 48 hr of exposure to the contaminated water the mussels were transferred to clean water tanks. They were tested after spending various amounts of time in the clean water. The radioactivity measured in the three contaminated water tanks indicated a concentration of about 20 ppb phenanthrene in the water. The total amount of radioactivity which was found in the tissue of the mussels indicated a concentration of 62 micrograms/kg wet weight. The highest concentrations were seen in mussels taken for examination immediately after being placed in the clean water. After 2-4 days in the clean water, about half the radioactivity was lost. At 28 days after exposure they still contained a high degree of radioactivity. Most of the radioactivity was located in the hepatopancreas. (Baker-FRC)

W81-04569

EQUILIBRIUM MODEL OF FATE OF MICROCONTAMINANTS IN DIVERSE AQUATIC FOOD CHAINS,

Manhattan Coll., Bronx, NY.
R. V. Thomann.

Canadian Jornal of Fisheries and Aquatic Sciences, Vol 38, No 2, p 280-296, 1981. 10 Fig, 7 Tab, 72 Ref.

Descriptors: *Pollutants, *Model studies, *Food chains, Path of pollutants, Aquatic life, Bioaccumulation, Biological magnification, Lead, Cesium, Polychlorinated biphenyls.

A simple model of chemical distribution in aquatic food chains was used to estimate expected levels of microcontaminants in aquatic organisms under different cases of chemical bioaccumulation. Field observed bioaccumulation of PCBs, lead, and cesium differed greatly between substances, but was similar in order of magnitude within each substance across diverse food chains. A study of the literature indicated that PCB levels in top predators are primarily due to transfer through the food chain. A steady state compartment food chain model was derived to estimate the relative effect of uptake directly from water versus food chain transfer. When the model was applied to the study it was concluded that food chain transfer of microcontaminants was significant for PCBs in top predators, that lead contamination was due to uptake from water only, and that cesium concentration factors were primarily due to food chain transfer with a high dependence on the salinity related phytoplankton adsorption. (Baker-FRC)
W81-04570

IMPACT OF FOSSIL FUEL COMBUSTION ON THE SEDIMENTS OF LAKE MICHIGAN,

Scripps Institution of Oceanography, La Jolla, CA.
E. D. Goldberg, V. F. Hodge, J. J. Griffin, and M. Koide.

Environmental Science and Technology, Vol 15, No 4, p 466-471, April, 1981. 4 Fig, 4 Tab, 14 Ref.

Descriptors: *Heavy metals, *Fly ash, *Lake Michigan, Air pollution, Carbon, *Fossil fuels, Metals, Sediments, Fuels, Path of pollutants, Water pollution sources, Plutonium radioisotopes, Radionuclides, Quartz, Aluminum, Manganese, Tin, Iron, Nickel, Copper, Lead, Chromium, Cadmium, Cobalt, Zinc, Vanadium.

Analysis of sediment cores from southern Lake Michigan revealed a pattern of increasing metal and charcoal deposition from combustion of oil, coal, and wood between 1930 and 1968, after which concentrations declined slightly. That year marked the beginning of widespread installation of control devices to remove fly ash from stack gases. Ranges of metal concentrations in sediments were as follows: (in ppm dry weight): Ni, 20-25; Cu, 15-24; Pb, 10-130; Cr, 50-140; Co, 8-13; V, 71-94; Zn, 50-350; and Mn, 550-1700. Although present levels are less than in 1968, they are still much greater than 19th century levels. Magnetic fly ash particles in sediments deposited before 1900 were angular in shape and at a 0.1% (dry weight) concentration. Later deposits were spherical and more concentrated, at the 0.2% level, typical of output from coal burning facilities. Quartz concentrations in electrostatically precipitated fly ash ranged from 3 to 13%. The levels of quartz in sediment samples decreased from 30% in the deepest and oldest to 18% at the surface. This is believed to be a result of dilution by anthropogenic materials. Sediment Mn concentrations were much greater than fly ash concentrations, a result of dissolved Mn movement through the sediments and precipitation on the surface. All other metals were more concentrated in the fly ash than in the sediments by ratios of 3 to 20, except for V, which was 180. (Cassar-FRC)
W81-04582

RUNOFF LOSSES OF ATRAZINE AND TERBUTRYN FROM UNLIMED AND LIMED SOIL,

Oregon State Univ., Corvallis. Dept. of Soil Science.
J. D. Gaynor, and V. V. Volk.

Environmental Science and Technology, Vol 15, No 4, p 440-443, April, 1981. 3 Fig, 2 Tab, 25 Ref.

Descriptors: *Herbicides, *Leaching, *Runoff forecasting, Fate of pollutants, Runoff, Soil erosion, Simulated rainfall, Terbutryne, Triazine pesticides, Pesticides, Atrazine, Solubility, Hydrogen ion concentration, Lime, Adsorption, Loam.

The leaching and loss of atracine and terbutryne from surface runoff waters and sediment were measured under conditions of simulated rainfall from limed and unlimed Peavine silt loam soil. When 7 cm of water were applied, 2-14% runoff of water from unlimed soil and 0-3% runoff from the limed soil was observed. Eroded sediments from the limed soil averaged 16 kilograms/hectare and contained higher levels of terbutryne than atrazine. Levels of terbutryne and atrazine in the runoff water and sediment samples taken 12 hours after herbicide application were only 0.3% and 3.7%, respectively, of the total amount applied. Of this amount, soil transport was responsible for 1-3% of the atrazine in the runoff. After 12 days, atrazine recovery from the limes and unlimed soil was 74% and 25%, respectively. Terbutryne was adsorbed by the soil (98%) to a greater extent than atrazine (60%). These findings suggest that both the solubility and the adsorption capacity of the soil for the herbicide should be considered to accurately predict herbicide losses in runoff. (Geiger-FRC)
W81-04583

GROUND-WATER GEOCHEMISTRY: ARSENIC IN LANDFILLS,

Robert S. Kerr Environmental Research Lab., Ada, OK.
A. W. Hounslow.

Ground Water, Vol 18, No 4, p 331-333, July/August, 1980. 1 Fig, 10 Ref.

Descriptors: *Arsenic compounds, *Landfills, *Geochemistry, Groundwater, Path of pollutants, Water pollution sources, Chemical properties, Chemical reactions, Anaerobic conditions, Aerobic conditions, Dissolved oxygen, Reduction(Chemical), Oxidation, Arsenical pesticides, Hydrogen sulfide, Sulfides, Iron, Oxygen.

Arsenic leaking from landfills commonly exists in +3 (arsenite) and +5 (arsenate) valence states, depending on the oxidation-reduction state of the groundwater and the presence of iron. Arsenite ion is 60 times as toxic to humans as arsenate ion. Three types of aqueous environments may be described: aerobic--dissolved oxygen present, hydrogen sulfide absent, unsaturated zone present, arsenate soluble, ferric hydroxide insoluble, arsenate adsorbed; anaerobic--dissolved oxygen absent, hydrogen sulfide absent, mildly reducing, shallow groundwater, arsenite soluble ferrous iron soluble; anaerobic--dissolved oxygen absent, hydrogen sulfide present, deeper groundwater, arsenic sulfides insoluble, heavy metal sulfarsenites insoluble, iron sulfide insoluble, coprecipitated arsenic sulfides. The most likely environmental pollution source is the mildly reducing anaerobic water, in which iron and toxic arsenite are most prevalent and most mobile. (Cassar-FRC)
W81-04586

DETAILS OF HYDROCHEMICAL VARIATIONS IN FLOWING WELLS,

Birmingham Univ. (England). Dept. of Geological Sciences.

For primary bibliographic entry see Field 2F.
W81-04591

INTERRELATIONS BETWEEN PH AND OTHER PHYSIOCHEMICAL FACTORS IN SURFACE WATERS OF THE CAMPINE OF ANTWERP, (BELGIUM): WITH SPCIAL REFERENCE TO ACID MOORLAND POOLS,

Centre de'Etude de l'Energie Nucleaire, Mol (Belgium).
J. H. D. Vangenechten.

Archiv fur Hydrobiologie, Vol 90, No 3, p 265-283, November, 1980. 8 Fig, 31 Ref.

Descriptors: *Bogs, *Acidic water, Sulfates, *Hydrogen ion concentration, *Chemical properties, Water analysis, Alkalinity, Path of pollutants, *Belgium, Calcium, Magnesium, Anions, Cations, Surface water.

The interrelations between pH, conductivity, and various ions in 53 surface waters near Antwerp, Belgium, were studied. The waters were divided into three classes according to pH: below 4.5, 4.5-7.0, and above 7.0. Measured and calculated conductivity agreed equally in the three types. However, in extremely acid bogs, a small excess of anions over cations was noticed, and in alkaline lakes, a large excess of anions over cations. Ca(2+) concentration increased significantly with pH in alkaline waters, and less significantly in more acid water. The contribution of sulfate to the total anionic content decreased sharply with pH. Although high levels of Ca and Mg ions appeared in acid waters, alkalinity (carbonate-bicarbonate) was very low. Indications are that the high acidity originates from both natural (sulfide breakdown) and industrial (sulfate-containing acid rain) sources. The excess of Na over Cl found in extremely acid bogs is unexplained. Physio-chemical compositions in these Belgian surface waters were comparable with those in acidified lakes in Scandinavia and North America. (Cassar-FRC)
W81-04642

5C. Effects Of Pollution

THE SIGNIFICANCE OF HEAVY METALS IN URBAN RUNOFF ENTERING THE OCCOQUAN RESERVOIR,

Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
C. W. Randall, R. C. Hoehn, T. J. Grizzard, S. P. Gawlik, Jr., and D. R. Helsel.

Available from the National Technical Information Service, Springfield, VA 22161 as PB81-231805, Price codes: A12 in paper copy, A01 in microfiche. Virginia Water Resources Research Center. Virginia Polytechnic Institute and State University, Bulletin 132, July, 1981. 252 p 19 Fig, 48 Tab, 145 Ref, 7 Append. OWRT-B-103-VA(5).

Descriptors: *Heavy metals, *Urban runoff, *Stormwater runoff, Bioaccumultion, Biomagnification, Water pollution, Urbanization, Water supply, Virginia, *Occoquan Reservoir, Northern Virginia.

Within Northern Virginia's Occoquan watershed, the concentrations of several heavy metals are greater in runoff from urban areas than found rural areas. This study was designed to determine the fate of a number of these metals in the aquatic ecosystem of the Occoquan Reservoir and its major tributaries. The principal focus was on metals in sediment and selected species of benthos and fish. Although below major urban stormwater discharge points copper and lead concentrated in caddisfly larvae and mercury accumulated in fillets of piscivorous fish greater than 1.5 kg, the biota was not greatly affected. For the most part, these metals were trapped in reservoir sediments. Therefore, even though the study clearly showed that urban contributions of heavy metals are sizeable, these metals appear to pose little danger to the aquatic biota or to humans who use the reservoir for recreation and as a source of drinking water.
W81-04301

ALGAL ASSAY STUDIES OF THE CHOWAN RIVER, NORTH CAROLINA,

North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
Mary M. Sauer, and E. J. Kuenzler.

Available from the National Technical Information Service, Springfield, VA 22161 as PB81-231821, Price codes: A05 in paper copy, A01 in microfiche. Water Resources Research Institute, University of North Carolina, Raleigh, Report No 161, April, 1981. 78 p 15 Fig, 8 Tab, 66 Ref. OWRT B-127-NC(2), 14-34-0001-0274.

Descriptors: *Algal growth, *Eutrophication, *Nutrients, Limiting nutrients, Nitrogen, Phospho-

rus, Nitrogen fixation cyanophyta, Aquatic plants, *Chowan River, North Carolina.

Algal assays were conducted on water collected from three stations on the Chowan River to investgate the presence of limiting nutrients during the summer of 1980. Two types of algal inocula were used: the laboratory cultured green alga Selenastrum capricornutum and samples of the natural Chowan River phytoplankton. Phosphorus and nitrogen simultaneously limited total algal growth in most experiments; other nutrients did not significantly limit growth. Species-specific responses to nutrient enrichment occurred. Single additions of phosphorus increased numbers of nitrogen-fixing blue-green algae. Therefore, phosphorus is the more critical limiting nutrient to growth of the bloom-forming genera Anabaena and Aphanizomenon. Other algae required additions of both nitrogen and phosphorus for large increase in growth.
W81-04303

EFFECTS OF STORM RUNOFF ON WATER QUALITY IN THE MILL CREEK DRAINAGE BASIN, WILLINGBORO, NEW JERSEY,
Geological Survey, Reston, VA. Water Resources Div.
J. C. Schornick, Jr., and D. K. Fishel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-203291, Price codes: A06 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 80-98, 1980. 111 p, 14 Fig, 62 Tab, 47 Ref.

Descriptors: *Storm runoff, *Water quality, *Water pollution effects, Watersheds, Precipitation, Streamflow, Flow duration, Stream discharge, Pesticides, Metals, Bacteria, Nutrients, Chemical analysis, *New Jersey, Burlington County, Willingboro, Mill Creek drainage basin.

The effect of storm runoff on the quality of water in streams receiving drainage from the 23.7-square-kilometer Mill Creek basin in Willingboro, NJ., was studied from October 1975 to September 1976. Stream discharge and 86 water-quality constituents were measured during base flow and storm runoff. Only 38 constitutents were detected in significant amounts under any streamflow condition. Constituent loads and concentrations in the runoff from the nonresidential part of the study area in the upstream part of the drainage basin affected stream quality more than runoff from the residential area. The nonresidential area contributed more of the nutrient load (nitrate, ammonia, organic nitrogen, and phosphorus), the common inorganics (sodium, potassium, magnesium, chloride, and sulfate), sediment, and organic carbon. The residential area contributed more calcium, nitrite, lead, iron, biochemical oxygen demand, and the pesticides, 2,4-D and silvex. With the exception of suspended iron, fecal coliform bacteria, suspended lead, and suspended phosphorus, all measured constituents met the recommended criteria set by the U.S. Environmental Protection Agency and the New Jersey Department of Environmental Protection, even during storms. (USGS)
W81-04343

EFFECTS OF PLACER MINING ON HYDROLOGIC SYSTEMS IN ALASKA--STATUS OF KNOWLEDGE,
Geological Survey, Anchorage, AK. Water Resources Div.
R. J. Madison.
Available from the OFSS, USGS, Box 25425, Denver Fed. Ctr., Denver, CO 80225, paper copy $3.50, microfiche $3.50. Geological Survey Open-File Report 81-217, 1981. 25 p, 41 Ref.

Descriptors: *Placer mining, *Environmental effects, *Water quality, *Hydrologic systems, Stream discharge, Sediment transport, Sediment control, Acid mine drainage, Organic loading, Heavy metals, Water pollution control, Fish, Benthos, Land management, Planning, *Alaska.

The report briefly summarizes the current state of knowledge regarding placer mining in Alaska. A review of literature indicates that nearly all of the significant information on the effects of placer mining on the hydrologic system in Alaska is referenced in available reports. The addition of sediment, as well as other indirect changes this generates, appears to be the primary impact of placer mining on Alaskan streams. Other potential water-quality effects that should be considered are: increases in organic loading in the stream system; increases in minor element content; potential for acid drainage; and impacts on fish and other aquatic biota. Existing information is adequate to define parameters that may be affected by placer mining but inadequate to quantify changes resulting from an individual mining operation or to allow the prediction of the magnitude or duration of the impact. Additional studies that would improve the knowledge of the effects of placer mining include: short-term assessments, using available photographic information and existing hydrologic records, to document historical changes and active placer mining features; short-term studies using emperical sediment-transport formulas to estimate the effects of placer mine activities; and river quality assessments of selected basins affected by placer mining. (USGS)
W81-04357

EFFECTS OF A CATTLESKIN TANNERY ON STREAM QUALITY AND BENTHIC MACROINVERTEBRATES IN CENTRAL MAINE,
Maine Univ. at Orono. School of Forest Resources.
R. L. Duval, C. R. Ferris, R. B. Owen, Jr., K. E. Biggs, and L. K. Fink, Jr.
Bulltin of Environmental Contamination and Toxicology, Vol 25, p 269-276, 1980. 1 Fig, 4 Tab, 6 Ref. OWRT-B-016-ME(6).

Descriptors: *Water quality, *Benthic fauna, Macroinvertebrates, *Waste water treatment, *Maine, *Sebasticook River, Turbidity, Heavy metals, Bottom sediments, Effluent, *Tannery discharges, Great Moose Lake, Stream elevation, Caustic soda, Calcium hydroxide, Sulfuric acid, Chromium sulfate, Pettsfield, Color, Conductivity, Total suspended solids, Total dissolved solids, Total volatile solids, Dissolved oxygen, Hydrogen ion concentration, Douglas Pond, Total organic matter, Atomic absorption spectroscopy, Physicochemical parameters.

Stream water quality and benthic macroinverterate characteristics were monitored, measured, and analyzed at one location upstream and seven stations downstream of a cattleskin tannery at Hartland, Maine. All sampling locations were on the main stem of the Sebasticook River between Great Moose Lake and Pittsfield, Maine. Three of the stations were in Douglas Pond, which is just upstream from Pittsfield. The study area was 15 km long, with an elevation decrease of 13 m, and a mean width of 160 m. Water quality measurements were made once each month between June and September 1976. Samples were collected near the substrate surface at a depth of 0.5-1.0 m. Determinations were made of color, turbidity, conductivity, total suspended solids, total volatile solids, dissolved oxygen, and pH. Sediment samples were collected in August and October, and heavy metal content was measured. Benthic macroinvertebrate samples were sorted and analyzed for heavy metals. Total taxa were lowest at the first two sampling locations downstream of the tanery, but those two locations had the highest numbers of individuals; species diversity was highest at the station upstream of the tannery. Water quality was lowest at the second downstream station, improving steadily until the last station.(Mullen-IPA)
W81-04359

RESPONSES OF COASTAL AND ESTUARINE ANIMALS FROM PUERTO RICO TO HIGH TEMPERATURES:
Puerto Rico Univ., Mayaguez. Water Resources Research Inst.
J. G. Gonzales, R. J. Zimmerman, and I. Sanders.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-233629, Price codes: A05 in paper copy, A01 in microfiche. Report, May, 1980. 91 p, 23 Fig, 12 Tab, 101 Ref, 1 Append. OWRT-A-046-PR(1).

Descriptors: *Industrial pollutants, *Thermal pollution, *Heated effluents, *Tropical regions, Ecosystem, Marine habitats, Coastal animals, Estuarine animals, Sediments, Puerto Rico, Biosystems, Temperature effects, Physiological adaptations, Temperature cycles, Thermal tolerance, Shallow-water habitat, Magueyes Island, Electronic thermocouple, Bivalves, Amphiopode, Polychocte, Snails, Echinoid, Holothurian, Copepoda, Intertidal zone, Corona reef, Tropical invertebrates.

Field temperature data were obtained on the south coast of Puerto Rico nearshore islets, to establish the range of temperatures, diurnal and seasonal temperature cycles, duration of temperature extremes, and the temperature variability among shallow-water habitats. A long term record of monthly sea water temperature means dockside at Magueyes Island (1957-1973) was tabulated, and 24-hour cycles of temperatures were measured for three sites at different periods during 1974, 1975 and 1976. The three sites represented various habitats: (1) a Thalassiu testridinum intertidal reef flat; (2) a shaded mangrove fringe; and (3) freely circulating back reef of surface water. Measurements were made with mercury thermometer or electronic thermocouple probe calibrated to be accurate within at least 0.1C. Ten invertebrates representative of shallow-water habitat were examined for thermal tolerance. Tests were usually conducted at 35 C or higher, and were designed to measure acute effects (mortality) of rapid thermal addition (shock treatment). Annual mean temperatures ranged from 27C to 29C, with monthly extremes of 24C to 31C. Thermal tolerances of the ten species are summarized in the 35 tables and figures. (Mullen-IPA)
W81-04363

HEALTH AND ENVIRONMENTAL EFFECTS OF SYNTHETIC FUEL TECHNOLOGIES: RESEARCH PRIORITIES,
Mitre Corp., McLean, VA. METREK Div.
For primary bibliographic entry see Field 5B.
W81-04374

PHYTOPLANKTON WATER QUALITY RELATIONSHIPS IN U.S. LAKES, PART VIII: ALGAE ASSOCIATED WITH OR RESPONSIBLE FOR WATER QUALITY PROBLEMS,
Environmental Monitoring Systems Lab., Las Vegas, NE.
W. D. Taylor, L. R. Williams, S. C. Hern, V. W. Lambou, and C. L. Howard.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-150831, Price codes: A14 in paper copy, A01 in microfiche. Environmental Protection Agency Project Summary EPA-600/S3-80-100, February, 1981. 3 p, 1 Tab.

Descriptors: *Lakes, *Water quality, *Algae, *Phytoplankton, Aquatic environment, Eutrophication, Bioindicators, Odor-producing algae, Taste-producing algae, Clogging, Toxicity, Aesthetics, Water pollution.

Environmental data are presented for 117 species and 24 genera of freshwater algae that have been associated with or responsible for water quality problems. The environmental data are based on algal occurrence records from 250 lakes sampled in Eastern and Southeastern States. These data provide a basis for analyses to further delineate the environmental requirements of problem algae. The water quality problems addressed include eutrophication, organic pollution, taste and odor, filter clogging, toxicity, and aesthetic nuisance. Data presented illustrate that most genera and species associated with eutrophic conditions also occur in nutrient-poor waters, thus limiting their indicator value with respect to nutrient enrichment. (Author's abstract)
W81-04380

THE EFFECT OF NITRILOTRIACETIC ACID (NTA) ON THE STRUCTURE AND FUNCTIONING OF AQUATIC COMMUNITIES IN STREAMS,
Academy of Natural Sciences of Philadelphia, PA.

T. Bott, R. Patrick, R. Larson, and C. Rhyne.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-213531, Price codes: A08 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/3-80-050, July, 1980. 173 p, 38 Fig, 46 Tab, 86 Ref.

Descriptors: *Toxicity, *Water pollution, *Nitrilotriacetic acid, *Copper, *Aquatic environment, Ecosystems, Chelation, Agricultural chemicals, Detergents, Heavy metals, Oxidation, Algae, Invertebrates, Bacteria, Water pollution effects.

Nitrilotriacetic acid (NTA) has been used in industrial processes, agriculture, and in some countries in detergent formulations. If the compound is widely used, it is expected that it will be present in many natural environments at low concentrations. Studies were conducted to determine some of the effects of NTA on organisms characteristic of a natural stream, measure its degradation by these organisms, and assess some of its possible abiotic chemical reactions under environmental conditions, with particular emphasis on chelation properties. Near-natural communities were established in microcosms and ecosystem streams in a greenhouse and exposed to NTA concentrations of 0.02 to 2 mg/l. NTA at 2 and 20 mg/l had only slight effects on algal community structure and function, and 2 mg/l protected organisms from the toxic effects of approximately 100 micrograms copper/l. Exposure to 2 mg NTA/l did not result in increased concentrations of Zn, Fe, Mn, or Cu in algae, Anacharis, Lemna, Planaria, and Tubifex species; accumulation of added copper by tubificids was not prevented by NTA. Bacterial communities adapted to 0.02 - 20 mg NTA/l and degraded the compound under aerobic conditions. Substantial extraction of metals from sediments occurred by 200 mg/l but not at lower levels. Although NTA was relatively resistant to chlorination, iminodiacetic acid (IDA) in concentrated solution reacted rapidly with aqueous chlorine to produce an unstable product with oxidizing properties, presumably N-chloro-IDA. Both NTA and IDA could be photoxidized in the presence of a sensitizer, but the reactions were very slow. (Moore-SRM)
W81-04383

MUNICIPAL SOLID WASTE DISPOSAL IN ESTUARIES AND COASTAL MARSHLANDS,
Municipal Environmental Research Lab., Cincinnati, OH.
A. N. Sodd.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-129223, Price codes: A09 in paper copy, A01 in microfiche. Environmental Protection Agency Project Summary EPA-600/S2-80-212, February, 1981. 3 p.

Descriptors: *Estuaries, *Coastal marshes, *Solid waste disposal, *Landfills, *Environmental effects, Regulations, Leaching, Municipal wastes, Waste disposal, Habitats, Economic effects.

Coastal lands have formally been identified as having significant ecological, flood control, water purification, and aesthetic value, but these areas have been used for the disposal of municipal solid wastes. Questionnaires (186, were mailed to governmental agencies having primary responsibility for coastal and estuarine municipal solid waste disposal in 23 coastal states and Puerto Rico. The questionnaires were designed to elicit specific data on case histories, environmental impacts, and governmental attitudes toward this type of solid waste disposal. Site visits were made to the administrative or regulatory agencies having jurisdiction over solid waste disposal landfills to evaluate adverse environmental or economic effects of such landfills. Municipal solid waste disposal sites should be located with consideration of geologic site characteristics to prevent leachate migration; operated so as to minimize leachate production; and monitored and regulated to control the detrimental effects to the environment. The impact of municipal solid waste disposal on coastal ecosystems has not been analyzed in depth by either the scientific or the regulatory community. The only well-documented impact is habitat depletion, probably the most serious impact resulting from municipal solid waste disposal. There are circumstances in which coastal disposal can be used for beneficial purposes, such as providing a substrate for habitat creation. (Moore-SRC)
W81-04384

LIMNOLOGY OF MICHIGAN'S NEARSHORE WATERS OF LAKES SUPERIOR AND HURON,
Michigan Dept. of Natural Resources, Lansing. Water Quality Div.
For primary bibliographic entry see Field 2H.
W81-04390

STUDY OF PATHOGENIC FREE-LIVING AMEBAS IN FRESH-WATER LAKES IN VIRGINIA,
Virginia Commonwealth Univ., Richmond. Dept. of Internal Medicine.
R. J. Duma.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-190936, Price codes: A03 in paper copy, A01 in microfiche. Environmental Protection Agency Project Summary EPA-600/S1-80-037, February, 1981. 5 p.

Descriptors: *Protozoa, *Pathogens, *Lakes, Water temperature, *Public health, Thermal pollution, *Naegleria, Pseudomonas, Bacteria, Serratia, Seasonal distribution, Nuclear power plants, Lake soils, Virginia, Swimming, Cooling ponds, *Amebas.

Pathogenic free-living amebas may produce a fatal infection of the central nervous system of man known as Primary Amebic Meningoencephalitis (PAM). In Richmond, Virginia, 17 such cases have occurred to date, more than in any other geographic location in the world. Fresh-water lakes in the vicinity of Richmond were examined for the presence of pathogenic free-living amebas, particularly Naegleria, to gain some understanding of their prevalence and the conditions or factors which might affect their existence or concentrations. Nine lakes, all within a 24-mile radius but with different limnological characteristics, were selected for biweekly sampling and study. Pathogenic amebas were isolated only from shallow bottom soil and its associated water, but not from deep water samples. Detection of pathogenic Naegleria increased significantly when water temperatures equalled or exceeded 30C. Two types of bacteria frequently isolated from lake waters, Pseudomonas fluorescens and Serratia marcescens, appeared in the laboratory to be inhibitory to pathogenic Naegleria; in virtually every lake from which Ps. fluorescens was consistently isolated, no pathogenic Naegleria were found. Of the lakes studied, the North Anna Reservoir containing several coolant lagoons and canals for a nuclear power plant was the most intriguing; the majority of pathogens and the most virulent organisms were isolated from this complex of lakes. Studies of this complex suggested that if natural fresh waters are thermally enriched for a sustained period, pathogenic Naegleria may be selected or concentrated, possibly serving as a source for contaminating nearby lakes. (Moore-SRC)
W81-04399

SOME FACTORS INVOLVED IN THE OCCURRENCE AND LIMITATION OF ALGAL BLOOMS IN AN AUSTRALIAN ESTUARY,
Metropolitan Water, Sewerage and Drainage Board, Sydney (Australia).
C. W. Heath, I. C. Smalls, and D. Cannon.
Water Science and Technology, Vol 13, No 1, p Tor 421-443, 1981. 10 Fig, 10 Tab, 28 Ref.

Descriptors: *Eutrophication, *Physicochemical properties, *Algal growth, Algae, Algal control, Nutrients, Phytoplankton, Aquatic plants, Plankton, *Estuaries, *Australia, Georges Rivers.

Long term monitoring information was studied in an attempt to relate physicochemical conditions to phytoplankton development, to assess possible effects of storms and algal seeding as bloom precursors, and to carry out laboratory algal culture work as an adjunct to the field studies which may delineate more precisely the nutrient growth response of the phytoplankton. The study are involved the mid-estuarine zone of the Georges River, whose catchment carries the greatest population of the three estuarine systems: Parramatta River, Georges River and Port Hacking River. Boundary waters were found to be significant in seeding the main estuary. A limitation of algal growth in the main estuary included increased flow and silica depletion. Storms appear to be extremely significant precursors to algal development as illustrated by details of algal succession after a specific storm event. Little difference was found in the growth potential of tributary and main esturine water in a uni-algal culture study with Phaeodactylum tricornutum. Single nutrient spikes produced little change, while combined nutrient spikes of P, N, Fe, and Si gave greater yields. It is suggested that mid-estuary, apart from one case of silica depletion, had incomplete phytoplankton utilizaton of the nutrients present therein. (Baker-FRC)
W81-04413

APPLICATION OF ECOLOGICAL DYNAMICS FOR EUTROPHICATION CONTROL IN KOBE HARBOUR AREA,
Osaka Univ. (Japan). Dept. of Environmental Engineering.
T. Morioka.
Water Science and Technology, Vol 13, No 1, p Tor 445-459, 1981. 10 Fig, 4 Tab, 3 Ref.

Descriptors: *Eutrophication, *Kobe Harbor, Phytoplanton, Nutrients, Bottom sediments, Sedimentation, Dredging, Model studies, Simulation, Trophic level, Algal growth, Algal control, Japan.

A preliminary survey on tidal current and pollutant diffusion coupled with a laboratory examination on nutrient release from bottom sediment, a field survey on plankton growth in an ecological microcosm, and a survey on urban runoff were carried out in an attempt to understand the ecological mechanism related to water pollution in the Kobe Harbuour Basin area. System simulation was used to study the effects of each countermeasure employed at the Kobe basin to control eutrophication. It was concluded that the eutrophic condition in Kobe Harbour will not be substantially improved even with the full installation of conventional secondary treatment. As a first step in the process of eutrophication control, it would be necessary to eliminate about 0.15 ton p/day in inorganic form. Advanced tertiary treatment of sewage would help, especially a method which has an efficiency of 70% phosphorus removal. Controlled use of synthetic detergents to reduce high phosphorus concentrations in waste water would also aid the situation. The dredging of bottom sediment proved to be a reasonable practical policy, while filtration of sea water was effective for only a short period after it was performed. (Baker-FRC)
W81-04414

LONG-TERM CHANGES IN BENTHIC FAUNA RESULTING FROM SEWAGE SLUDGE DUMPING INTO THE NORTH SEA,
Hamburg Univ., (Germany, F.R.). Inst. fuer Hydrobiologie und Fischereiwissenschaft.
H. Caspers.
Water Science and Technology, Vol 13, No 1, p Tor 461-479, 1981. 11 Fig, 26 Ref.

Descriptors: *Benthic fauna, *Sludge disposal, Aquatic animals, Benthos, Fauna, Benthic environment, *North Sea, Waste water disposal.

This study was undertaken to evaluate the introduction of Hamburg sewage sludge into a region of the North Sea, beyond the mouth of the Elbe, approximately opposite Lightship Elbe I. Benthic samples were taken regularly at about 120 stations. Particle size, water content, pore volume, and the content of organic and inorganic carbon were the parameters studied. Comparisons were made between the silty areas uninfluenced or only slightly influenced by sewage sludge and those in the central dumping area. Sewage dumping began in 1961. A great increase in the abundance of the bivalve,

Abra alba, occurred in much of the dumping area, as the ecological adaptations of this species are well suited to exploit the large increase in nutrients available. Several polychaetes were also seen to have established large populations in the dumping area. From one year to the next particular abundance of individual species varied considerably. The application of these findings to studies designed to protect the environment is discussed. (Baker-FRC)
W81-04415

THE ROLE OF BOTTOM DEPOSITS IN THE OXYGEN REGIME OF A POLLUTED ESTUARY,
Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
J. James.
Water Science and Technology, Vol 13, No 1 p Tor 491-498, 1981. 3 Fig, 5 Tab, 9 Ref.

Descriptors: *Benthic environment, *Mud, *Estuaries, Ocean bottom, Aquatic animals, Benthos, Aquatic plants, Biomass, Tyne River, Organic matter, Organic wastes, *Waste water disposal *Oxygen uptake, United Kingdom.

An initial study of the contribution of bottom muds to the oxygen regime of the River Tyne estuary is described, along with implications of the findings for modeling of the regime. There are no major sources of pollution upstream of this estuary, but below the tidal limit dramatic changes occur. Within a 30 km stretch the estuary receives wastes from a population of over 2 million. The estuary was divided into five reaches of 6 km each. In each reach the bottom muds were studied, together with measurements to determine complete balances on dissolved oxygen and organic matter. Even though the findings are as yet preliminary, the dominating nature of benthal processes became apparent, as they dominate the fluxes of both organic matter and dissolved oxygen in the Tyne estuary. This finding is in agreement with reports of studies on freshwaters and may well apply to many other estuarine situations. If so, there is strong argument for modifying the conventional type of mathematical model that has been used for representing the dissolved oxygen regime in estuaries. The findings of this study also suggest that greater attention should be given to the benthal fluxes to determine how they are influenced by environmental conditions. (Baker-FRC)
W81-04417

AN APPRAISAL OF BACTERIAL INDICATORS OF POLLUTION IN SEA WATER,
Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W81-04421

THE IMPACT OF SEWERS ON THE NUTRIENT BUDGET OF LAKE GEORGE, NY,
Rensselaer Polytechnic Inst., Troy, NY. Fresh Water Inst.
D. B. Aulenbach, N. L. Clesceri, and J. R. Mitchell.
Water Science and Technology, Vol 13, No 2, p Tor 767-782, 1981. 4 Fig, 5 Tab, 33 Ref.

Descriptors: *Lakes, *Eutrophication, *Nutrients, *Lake George, Lake basins, New York, Nitrogen, Phosphorus, Septic tanks, Sewer systems, Urban planning, Urban runoff, Waste water.

Various sources of nutrients were measured over the past several years in Lake George, New York. The lake is a medium-sized lake formed by the last glacier from two river valleys about 10,000 yr ago. The lake is long and narrow, and quite deep for its width. Despite the relatively good quality of the water in the main part of the lake, there have been numerous observations of increasing algal growths occurring in some of the more heavily populated bays. A proposal has been submitted to expand the sewer system in the South Lake George area and provide treatment and disposal out of the basin in order to reduce suspected nutrient inputs from septic tanks and allow additional development to occur. Estimates have been made of the reduction of nutrient input resulting from this procedure as well as estimates of increased nutrient input due to increased development and subsequent urban runoff. It was concluded that nitrogen inputs to South Lake George would be decreased by about 10%, but phosphorus would be increased by 8%, which would apparently be sufficient to carry the South Lake into the eutrophic range. (Baker-FRC)
W81-04432

THE STIMULATION OF AUTOTROPHIC PRODUTION BY URBAN STORMWATER-BORNE NUTRIENTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W81-04438

THE SENSITIVITY TO PHOSPHORUS AND NITROGEN LOADS, OF LAKE ROTORUA, NEW ZEALAND,
Ministry of Works and Development, Hamilton (New Zealand).
R. A. Hoare.
Water Science and Technology, Vol 13, No 2, p Tor 897-904, 1981. 1 Fig, 2 Tab, 16 Ref.

Descriptors: *Nutrients, *Lakes, Nitrogen, Phosphorus, *Lake Rotorua, New Zealand, *Eutrophication, Denitrification.

The present study was conducted to obtain a detailed understanding of the loads of all the important forms of nitrogen and phosphorus entering Lake Rotorua, New Zealand. Secondary treated effluent from the city of Rotorua enters this lake. In February of 1975 a particularly severe algal bloom occurred, prompting attention to the lake and its condition. The current discussion is restricted to a consideration of annual mean concentrations of phosphorus and chlorophyll. Flows were continuously monitored of the 12 major streams entering the lake. Twelve minor streams were monitored monthly. The phosphorus and nitrogen budgets showed that about 70% of all phosphorus entering the lake stayed in the sediments, and about 66% of the nitrogen either stayed in the sediments or was lost to the atmosphere by denitrification. About half of the nitrogen loss is by denitrification. The loss of P is consistent with several available empirical prediction equations. Reducing the sewage load to zero was predicted to reduce the annual mean phosphorus concentration by about 20% and the chlorophyll concentration by 1.5-3.5 mg per cu m, depending on the prediction model employed. (Baker-FRC)
W81-04439

LONG-TERM UPTAKE AND RELEASE OF HEAVY METALS BY ASCOPHYLLUM NODOSUM (L.) LE JOL. (PHAEOPHYCEAE) IN SITU,
Trondheim Univ. (Norway). Inst. of Marine Biochemistry.
I. Eide, S. Myklestad, and S. Melsom.
Environmental Pollution (Series A), Vol 23, No 1, p 19-28, September, 1980. 4 Tab, 16 Ref.

Descriptors: *Algae, *Heavy metals, *Accumulation, Rivers, Zinc, Cadmium, Lead, Mercury, Norway.

Long-term uptake and release of zinc, cadmium, lead, and mercury by Ascophyllum nodosum seaweed were studied in situ by moving whole plants from areas with low heavy metals in the water to areas with high heavy metals in the water, and vice versa. The seaweed took up zinc and cadmium very slowly in winter and relatively quickly in summer. The uptake of lead showed little seasonal variation, while mercury showed some seasonal variation. The release of zinc, cadmium, and mercury showed a marked seasonal variation. Zinc was taken up all year, so the uptake of this metal may be linked with metabolic processes. A similar mechanism may also exist for cadmium, which has been shown to be energy dependent in microorganisms. The uptake and release of lead seemed to be an ion-exchange process, since lead showed little seasonal dependence. Knowledge of the content of heavy metals in this alga and the exchange processes of metals with the water can be a valuable tool in heavy metal pollution control. (Small-FRC)
W81-04473

HISTORY OF LAKE ERIE WATER QUALITY,
Ohio State Univ., Columbus. Dept. of Botany.
C. E. Taft.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-107070, Price codes: A17 in paper copy, A01 in microfiche. In: Lake Erie Nutrient Control Program: An Assessment of Its Effectiveness in Controlling Lake Eutrophication, Environmental Protection Agency Report EPA-600/3-80-062, July, 1980. p 64-70, 15 Ref.

Descriptors: *Water quality, *Lakes, *History, *Water pollution, *Eutrophication, Aquatic life, Turbidity, Hydrocarbons, Inorganic compounds, Sedimentation rates, Oxygen depletion, Dissolved solids, Heavy metals, *Lake Erie.

Few technical studies of Lake Erie water quality before 1920 exist, but there are observations recorded from the late 17th century on. The earliest records report clear water with abundant fish and plants. By 1811 the river at Cleveland was contaminated with decaying plants and putrid animal substances, and in 1828 increases in turbidity in the shallow areas of the lake were observed after storms. Significant contamination of water by mineral salts and petroleum from wells along tributary streams was reported in 1903. The first algal bloom was reported in 1859; the latest of great extent occurred in 1970. It is estimated that there has been a three-fold increase in sedimentation rate in the last century. Oxygen depletion has become serious as has the total dissolved solids concentration over the past 50 yr. Significant increases in P, total nitrogen, ammonia, chloride, sulfate, Hg, Pb, Zn, Cd, Cu, and organic carbon have occurred. (Brambley-SRC)
W81-04477

OXYGEN DEPLETION AND ANOXIA IN THE CENTRAL AND WESTERN BASINS OF LAKE ERIE, 1973-1975,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
J. E. Zapotosky, and C. E. Herdendorf.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-107070, Price codes: A17 in paper copy, A01 in microfiche. In: Lake Erie Nutrient Control Program: An Assessment of Its Effectiveness in Controlling Lake Eutrophication, Environmental Protection Agency Report EPA-600/3-80-062, July, 1980. p 71-102, 21 Fig, 7 Tab, 22 Ref.

Descriptors: *Eutrophication, *Oxygen depletion, *Seasonal variation, *Trophic level, *Lake basins, Solubility, Thermal stratification, Hypolimnion, Anaerobic conditions, *Lake Erie basin.

From spring until fall turnover, the central and western basins of Lake Erie show a steady decline in dissolved oxygen concentrations, initially due to increasing solubility of oxygen in the warming water, but later due to the establishment of a themocline. The results of this three-year study show that the hypolimnion of the central basin is subject to relatively large exchanges with overlying and adjacent waters and that these fluxes must be considered in the calculation of depletion rates. Areal and volumetric depletion rates for the central basin did not change over the period, averaging 0.53-0.67 g oxygen/sq m/day and 0.12-0.13 g oxygen/cu m/day, respectively. On these depletion rates the central basin can be considered eutrophic. The areal extent of anoxia in the central basin varies greatly from year to year, and so cannot be used as the criterion for judging the trophic state. The bottom waters of the western basin continue to become depleted of oxygen and temporarily anoxic. (Brambley-SRC)
W81-04478

CHLOROPHYLL A AND PHEOPIGMENT DISTRIBUTION IN THE CENTRAL AND WESTERN BASINS OF LAKE ERIE,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
For primary bibliographic entry see Field 2H.
W81-04482

PRIMARY PRODUCTIVITY SURVEY OF THE CENTRAL AND WESTERN BASINS OF LAKE ERIE,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
C. T. Sheffield, and W. E. Carey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-107070, Price codes: A17 in paper copy, A01 in microfiche. In: Lake Erie Nutrient Control Program: An Assessment of Its Effectiveness in Controlling Lake Eutrophication, Environmental Protection Agency Report EPA-600/3-80-062, July, 1980. p 231-271, 14 Fig, 5 Tab, 35 Ref.

Descriptors: *Lake basins, *Primary productivity, *Phytoplankton, *Photosynthesis, *Limiting factors, *Limiting nutrients, Phosphorus, Light penetration, Algae, Light intensity, Seasonal variation, Spatial distribution, Temporal distribution, *Lake Erie basin.

During July-October 1974, the vertical, horizontal, and temporal distribution of primary productivity was investigated, using the carbon-14 method and shipboard incubation of samples. In situ experiments were also conducted, and the results compared with previous studies. Incubator, integral, and daily integral productivity in 1974 were, respectively, 4.1-124 mg C/cu m/h, 16-364 mg C/sq m/h and 140-4370 mg C/sq m/day for the western basin, and 5.1-51.2 mg C/cu m/h, 44-242 mg C/sq m/h, and 530-2180 mg C/sq m/day for the central basin. These figures are within the range of previously reported productivity rates. The western basin showed greater productivity throughout the season. In the western basin maximum productivity occurred at a depth of 1 m. The algae are photosynthetically active at lower light intensities in October, as opposed to July and September, and maximum productivity is reached within a narrower range of light intensities. Light appears to be a controlling factor in primary productivity in the western basin, although phosphorus may also be limiting. (Brambley-SRC)
W81-04483

BENTHIC MACROINVERTEBRATE DISTRIBUTIONS IN THE CENTRAL AND WESTERN BASINS OF LAKE ERIE,
Ohio State Univ., Columbus. Dept. of Entomology.
For primary bibliographic entry see Field 2H.
W81-04485

THE UTILITY OF EXTRACTION PROCEDURES AND TOXICITY TESTING WITH SOLID WASTES,
Oak Ridge National Lab., TN.
C. W. Francis, M. P. Maskarinec, J. L. Epler, and D. K. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-175086, Price codes: A13 in paper copy, A01 in microfiche. In: Disposal of Hazardous Waste; Proceedings of the Sixth Annual Research Symposium, March 17-20, 1980, Chicago, Illinois. Environmental Protection Agency Report EPA-600/9-80-010, March, 1980. p 39-45, 1 Fig, 2 Tab, 5 Ref.

Descriptors: *Bioassay, *Testing procedures, *Solid wastes, *Toxicity, Leachates, Phytotoxicity, Chemical composition, Solubility, Evaluation, Mutagenesis.

Seventeen solid wastes from diverse origins were extracted using the proposed EPA extraction procedure (EP). These extracts were characterized chemically and tested for toxicity and mutagenicity, using Daphnia, root elongation, and microbial bioassays. None of the EP extracts appeared to be mutagenic, however, the negative responses may be due to the inability of the acidic, agueous EP to extract nonpolar organics and/or possible sorption of these compounds on the type of filter used in the EP. Several of the extracts were toxic in the phytotoxicity and/or aguatic test systems. Acetic acid in the EP interfered in the phytotoxicity and aquatic toxicity bioassays, making interpretation difficult. To prevent possible heavy metal contamination from stainless steel, a glass or Teflon extractor vessel should be used. A modified or replacement filtering procedure should be used to eliminate sorption of highly water-insoluble organics on the filter membrane. A comprehensive evaluation should be made correlating the properties of the EPA proposed EP extract and authentic landfill leachates. (Brambley-SRC)
W81-04488

IODINE-131 LEVELS IN SLUDGE AND TREATED MUNICIPAL WASTE WATERS NEAR A LARGE MEDICAL COMPLEX,
Texas Univ. Health Science Center at Houston. School of Public Health.
For primary bibliographic entry see Field 5B.
W81-04543

HEAVY METAL ACCUMULATION BY AQUATIC FUNGI AND REDUCTION IN VIABILITY OF GAMMARUS PULEX FED CD(2+) CONTAMINATED MYCELIUM,
Sheffield Univ. (England). Dept. of Microbiology.
J. E. Duddridge, and M. Wainwright.
Water Research, Vol 14, No 11, p 1605-1611, November, 1980. 5 Fig, 2 Tab, 12 Ref.

Descriptors: *Heavy metals, *Aquatic fungi, *Shrimp, Zinc, Lead, Cadmium, Toxicity, Food chains, Water pollution effects, Accumulation.

The effects of Cd(2+), Pb(2+), and Zn(2+) on mycelial growth of three aquatic fungi were determined, and the ability of these fungi to accumulate heavy metals in vitro was demonstrated. The study was also intended to determine whether freshwater shrimp could be maintained on fungal mycelium and whether Cd(2+) could be transferred from this food source to the invertebrate. The addition of lead (1.0 and 2.5 micrograms/gram) and cadmium (2.5 and 5.0 micrograms/gram) decreased the growth rate of the fungi, while the addition of zinc had no effect. Very small doses of cadmium and zinc actually stimulated fungal growth. The fungi accumulated considerable amounts of all metals. Three species of fungi supported the groth of freshwater shrimp, but a marked reduction of shrimp viability occurred when they were fed Pythlum sp. containing 150 to 170 micrograms of Cd(2+) per gram. None of the shrimps fed cadmium survived beyond 13 days, while 60% survived beyond 21 days when fed uncontaminated food. Bodies of dead shrimp contained Cd(2+) (22.03 micrograms per gram), indicating that the metal can be transferred from the aquatic fungi. This fungus is the first step in a food chain containing fish and higher organisms. (Small-FRC)
W81-04553

BROMINE TRACER STUDY OF THE CHLORINATION WITH HYPOCHLORITE IN A BUFFERED AND A NON-BUFFERED AQUEOUS SOLUTION CONTAINING CHLORIDE, BROMIDE AND PHENOL AS MODEL COMPOUND,
Keuring van Electrotechnische Materialen, N.V., Arnhem (Netherlands). Chemistry Dept.
For primary bibliographic entry see Field 5A.
W81-04555

DEOXYGENATION OF WATER FOLLOWING USE OF THE HERBICIDE TERBUTRYN SIMULATED IN A BATCH CULTURE SYSTEM,
Agricultural Research Council, Oxford (England). Weed Research Organization.
G. I. Wingfield, and J. M. Johnson.
Bulletin of Environmental Contamination and Toxicology, Vol 26, No 1, p 65-72, 1981. 2 Fig, 10 Ref.

Descriptors: *Herbicides, *Algal control, *Oxygen depletion, Eutrophication, Model studies, Hydrogen ion concentration, Biochemical oxygen demand, Terbutryn, Simulation, Dissolved oxygen, Aquatic populations, *Aquatic weed control.

Control of aquatic weeds with herbicides may sometimes cause deoxygenation of the treated water. A system developed to simulate the deoxygenation of water in a fermenter vessel was examined using the herbicide terbutryn and water from a small rubber-lined reservoir fed by a natural stream. A batch culture system was maintained in which oxygen levels, pH, temperature, and redox potential were continually recorded. Algae, bacteria, and protozoa were counted in samples taken at the start of the experiment, before the addition of algal suspensions, after addition of terbutryn, and every 24 hours for 7 days. No diurnal photosynthetic cycle was present in the herbicide treated vessel, and redox response following herbicide treatment was similar to that of oxygen. In the control vessel, pH rose for 120 hours and then was constant, while in the treated vessel, it fell from 8.0 to 6.8 at the start of recovery, before rising to 7.7. Terbutryn decreased the number of algal cells but caused no definite effects on protozoan populations. Total bacterial populations rose to a maximum at 94 hours in the control vessel, and at 70 and 142 hours in a the herbicide treated vessel. The validity of the laboratory model was confirmed by good agreement between model results and those obtained when terbutryn was applied for algae control in an Oxfordshire lake. (Geiger-FRC)
W81-04564

ACCUMULATION AND ELIMINATION OF RADIOACTIVITY IN THE NORWAY LOBSTER (NEPHROPS NORVEGICUS) FOLLOWING INTRAGASTRIC ADMINISTRATION OF (9-14C)PHENANTHRENE,
Institute of Marine Research, Bergen (Norway).
K. H. Palmork, and J. E. Solbakken.
Bulletin of Environmental Contamination and Toxicology, Vol 25, No 4, p 668-671, October, 1980. 1 Tab, 6 Ref.

Descriptors: *Accumulation, *Hydrocarbons, *Lobsters, Radioactivity techniques, Crustaceans, Path of pollutants, Muscle, Phenanthrene, *Radioactivity effects, Assimilative capacity, *Norway.

Norway lobsters, representative mud-dwelling crustaceans of commercial importance, were given a dose of (9-14C)phenanthrene orally to determine the accumulation and elimination of aromatic hydrocarbons. The highest amounts of radioactivity were recovered from hepatopancreas and muscle. In all tissues except the intestine, highest levels were measured one day after dosing. After 28 days, only minute amounts remained in the tissues. These results agreed with earlier results obtained in bony fishes. Thus, the lobster accumulated the hydrocarbon at a high rate, and was able to eliminate most of the radioactivity within a few weeks after a single dose. Similar research with blue crabs found that a great deal of the injested hydrocarbon was excreted within the first two days. Levels of hydrocarbons were low in the stomachs and intestines of lobsters, in contrast to the results with crabs. (Small-FRC)
W81-04567

HEMATOLOGICAL RESPONSES OF LARVAL RANA CATESBIANA TO SUBLETHAL NITRITE EXPOSURES,
North Texas State Univ., Denton. Dept. of Biological Sciences.
D. W. Huey, and T. L. Beitinger.
Bulletin of Environmental Contamination and Toxicology, Vol 25, No 4, p 574-577, October, 1980. 1 Tab, 15 Ref.

Descriptors: *Nitrites, *Frogs, *Blood, Chlorides, *Water pollution effects, Toxicity, Laboratory studies.

Research was designed to determine whether bullfrog tadpoles (Rana catesbiana) would form methemoglobin when exposed to nitrite, and whether increases in ambient chloride concentrations would offer protection against methemoglobinemia. Tadpoles were exposed to nitrite concentrations of 50,

10, 53, 3, and 1 mg/liter, with a control at less than 0.01 mg/liter. Chloride inhibition tests used 50 and 10 mg/liter NO2 exposures with molar Cl:NO2 ratios and 13:1 and 5.2:1 respectively. Blood was collected following 24 hr exposure. The dose-response experiment indicated that although total hemoglobin levels were not significantly altered, a strong positive relationship was found between methemoglobinemia and nitrate concentration. Tadpoles exposed to 50 mg/liter nitrite at molar ratios of 13:1 (Cl:NO2) and 5.0 mg/liter at 5.2:1 (Cl:NO2) had methemoglobin levels that were not elevated above control levels. This suggests that chloride does provide protection against methemoglobinemia in frogs, and at lower levels than were found in research on catfish. (Small-FRC)
W81-04568

PLASMA CORTICOSTERONE AND THYROXINE CONCENTRATIONS DURING CHRONIC INGESTION OF CRUDE OIL IN MALLARD DUCKS (ANAS PLATYRHYNCHOS),
Fish and Wildlife Service, Laurel, MD. Patuxent Wildlife Research Center.
B. A. Rattner, and W. C. Eastin, Jr.
Comparative Biochemistry and Physiology C: Comparative Pharmacology, Vol 68, No 2, p 103-107, 1981. 2 Fig, 2 Tab, 21 Ref.

Descriptors: *Oil pollution, *Ducks, Petroleum products, Oil, Waterfowl, Biochemistry, *Water pollution effects, Health hazards, Physiological effects.

The morphological responses and alterations in tolerance which accompany oil exposure in ducks have been attributed to activation of the hypophyseal-adrenal axis by nonspecific stress. A preliminary assessment of adrenal and thyroid function was conducted in 150 mallard ducklings chronically exposed to various dietary quantities of crude oil. The diets consisted of untreated mash, mash mixed with 0.150 percent South Louisiana crude oil, and mash mixed with 0.015, 0.150, and 1.500 percent Alaska Prudhoe Bay crude oil. Blood samples were collected from the ducks after 6, 12, and 18 weeks of the dietary treatments. At week 6, the plasma corticosterone values from birds in the 0.150 percent South Louisiana crude oil and the 0.015 percent Prudhoe Bay crude oil treatment groups were similar to control group levels; however, at weeks 12 and 18 mean plasma corticosterone concentrations in these treatment groups appeared to be somewhat reduced. Dietary exposure to the higher levels of Prudhoe Bay crude oil uniformly reduced mean corticosterone values at all sampling times. Plasma thyroxine concentrations were not significantly altered in ducks in any of the treatment groups. Although the aliphatic components quantified in the crude oils were relatively similar in concentration, the concentrations of aromatics which were analyzed were generally greater in the Prudhoe Bay samples than in the South Louisiana crude oil, perhaps accounting for the differences in the effects of equal concentrations of the two crude oils on corticosterone levels. The observed alteration in corticosterone concentration could reduce the tolerance of the ducks to temperature and dietary fluctuations in the environment. The disparity between the findings of no major change in thyroid function in this study and earlier findings of increased thyroid activity in externally contaminated birds emphasizes the differential side effects of these two modes of contamination in mallard ducks. (Carroll-FRC)
W81-04571

CHLOROPHYLL-PHOSPHORUS RELATIONS IN INDIVIDUAL LAKES. THEIR IMPORTANCE TO LAKE RESTORATION STRATEGIES,
Minnesota Univ., Minneapolis. Limnological Research Center.
V. H. Smith, and J. Shapiro.
Environmental Science and Technology, Vol 15, No 4, p 444-451, April, 1981. 10 Fig, 2 Tab, 42 Ref.

Descriptors: *Lake, *Eutrophication, *Nutrients, Phosphorus compounds, Chlorophyll, Algae, Model studies, Phytoplankton, Aquatic life, Water pollution effects, Water pollution control.

Analysis of published data on the relationship between algal biomass and nutrient reduction in lakes confirms that reductions in total phosphorus concentrations produce consistent declines in chlorophyll. Therefore, phosphorus reduction is the key to lake restoration. This contradicts the conclusions of the threshold model developed from the National Eutrophication Survey, 1972-75, which predicts that chlorophyll production will not decline until a threshold concentration of phosphorus is reached. One problem with this model is that too few data points were obtained during the summer months when chlorophyll response is most marked. The authors urge caution in using models at their present stage of development. Some of the 16 lakes to which the model was applied responded uniquely, suggesting that not all lakes' responses may be accurately predicted using current global eutrophication models. In most cases, reducing P concentration by such control measures as nutrient dilution, nutrient inactivation with sodium aluminate, or diversion of waste water effluent produced an immediate reduction in chlorophyll a level. (Cassar-FRC)
W81-04580

THE SUDD AS A WETLAND ECOSYSTEM AND THE JONGLEI CANAL PROJECT,
Jonglei Canal Project, Khartoum (Sudan).
A. A. Tahir.
Water Supply and Management, Vol 4, No 1/2, p 53-54, 1980. 5 Ref.

Descriptors: *Canals, *Irrigation water, *Social aspects, *Wetlands, *Environmental effects, *Jonglei Canal Project, Sudan, Ecology, Water resources management, Balance of nature, Surface drainage, Sudd, Inland waterways, Groundwater, Swamps, Aquatic environment, Ecosystems.

Environmentalists' objections to the Jonglei Canal Project, Sudan, are answered. This canal, which will drain about 10% of the present Sudd swamp area, should have no effect on rainfall. Crossing points for cattle and people and watering points will be provided. The effects of man's activities are minor compared with natural fluctuations in the swamp's water level. Groundwater in the Nubian Sandstone Aquifer should not be depleted; in fact, water quality will improve because of additional recharging. The Project is expected to improve the quality of life and the economy in the area, providing irrigation water, flood control, and a navigable waterway. (Cassar-FRC)
W81-04606

OIL POLLUTION STUDIES IN SOUTH AFRICA,
Sea Fisheries Inst., Sea Point (South Africa).
P. Chapman, and R. J. Watling.
South African Journal of Science, Vol 76, No 12, p 534-535, December, 1980. 3 Fig, 7 Ref.

Descriptors: *Oil pollution, *Oil spills, *Water pollution effects, Environmental effects, Dispersants, Oil tankers, Toxicity, Aquatic life, *South Africa.

Oil pollution problems and their solutions for the South African shipping lanes are discussed, and a research program designed to determine the movement and effects of oil slicks is described. South Africa tried to restrict oil tankers to a specific shipping lane, but accidents caused that policy to be abandoned. Two tugs are operated by the Department of Transport, equipped to act as both search platforms and dispersant dispensing vessels. A severe spill in 1977 led the government to see that very little was known about spills and their effects on biota. Thus, the National Oil Research Programme was set up; tests on the toxicity of oils and oil dispersants are now being carried out. Continuous flow experiments have been designed to test the accumulation and toxicity of oil and dispersants on commercially valuable species including the crayfish, Jasus lalandii. The effects of oil on sea birds, particularly the Jackass penguin, Spheniscus demersus, will be investigated. Also, the effects of oil on estuarine ecosystems will be studied in the field and in the lab. (Small-FRC)
W81-04611

CHANGES IN STANDING CROP AND PHOTOSYNTHETIC RATE ATTENDANT ON THE FILM DEVELOPMENT OF PERIPHYTON IN A SHALLOW EUTROPHIC RIVER(IN JAPANESE),
Tokyo Metropolitan Univ. (Japan). Dept. of Biology.
M. Aizaki.
Japanese Journal of Limnology, Vol 41, No 4, p 225-234, October, 1980. 13 Fig, 1 Tab, 22 Ref.

Descriptors: *Standing crops, *Bacteria, *Photosynthesis, Sessile algae, Periphyton, Rivers, *Eutrophication, Heterotrophic bacteria, Microorganisms, Water pollution effects, *Tamagawa river, Japan, Aerobic bacteria, Aquatic plants, Productivity.

Film development of periphyton wqs investigated using artificial substrates in shallow eutrophic waters of the Tamagawa River, Japan. The pioneer colonizers were bacteria. Algae joined the community after bacteria were established, after about 1 week. In the mature stage algae were dominant, 80% at maximum and 50-70% of carbon weight under average spring conditions. There were 10 million to 1 billion cells per sq cm of aerobic heterotrophic bacteria, including some sulfate reducers, at the mature stage. Photosynthetic rates of sessile algae varied from 3-20 mg oxygen per mg chlorophyll a per hour in the early stage to 1-3 mg oxygen per mg chlorophyll a per hour in the mature stage. The photosynthetic rate decreased drastically just before periphyton exfoliation occurred at around 42 days. (Cassar-FRC)
W81-04630

THE EFFECTS OF THE LAND RECLAMATION AND FRESHENING PROJECT ON THE WATER ENVIRONMENT IN LAKE NAKANOUMI--THE PRIOR INVESTIGATION AND ITS PROBLEMS(IN JAPANESE),
Shimane Univ., Matsue (Japan). Dept. of Agricultural Chemistry.
For primary bibliographic entry see Field 6G.
W81-04631

REGULATION OF ENVIRONMENTAL POLLUTANTS: INTRODUCTORY REMARKS,
Health Effects Research Lab., Research Triangle Park, NC.
S. S. Sandhu.
Environmental Health Perspectives, Vol 37, p 1-3, January, 1981.

Descriptors: *Environmental effects, *Bioassay, *Carcinogens, Water pollution effects, Pesticides, Air pollution effects, Monitoring, Toxins, Waste disposal, Bioindicators, Phytotoxicity, Hazardous materials, Testing procedures.

The long-term effects of atmospheric and water pollution and the use of pesticides on crops and food products are not fully understood. Industrialized countries are faced with the management of toxic waste products, and scientists must find ways to evaluate toxic substances for mutagenic and carcinogenic effects. Over 70,000 chemical compounds are in common use. Billions of gallons of industrial effluents are discharged to our lakes, rivers and oceans each year. Since 1970, the Environmental Protection Agency, has been responsible for the control of environmental pollutants. Efforts have been made to coordinate research and regulatory activities of federal agencies which control hazardous substance. To determine whether a substance can cause cancer, traditional epidemiological studies, animal bioassays, and short-term tests are utilized. Environmental monitoring methods are needed that assess the interactions of complex chemical mixtures. Efforts are being made to establish plant systems as valid monitoring mechanisms for mutagens. The advantages of using plants as screening systems for environmental pollutants are numerous. Plants can also be used for in situ environmental monitoring and provide an inexpensive way of studying the chronic effects of pollution. (Geiger-FRC)
W81-04635

GERMINAL CELL MUTAGENESIS IN SPECIALLY DESIGNED MAIZE GENOTYPES,
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5A.
W81-04636

INFLUENCES OF SEWAGE AND TRADE EFFLUENT DISCHARGES ON WATER RESOURCES,
Anglian Water Authority (England).
P. J. Matthews.
Effluent and Water Treatment Journal, Vol 21, No 1, p 35, 37-40, January, 1981. 1 Tab, 13 Ref.

Descriptors: *Catchment areas, *Water pollution, *Water quality management, Water quality, Water pollution prevention, Water pollution control, Industrial wastes, Effluents, Municipal waste water, Aquifers, River basins, Toxicity, Planning, Great Britain.

The abstraction of water for potable purposes is used to demonstrate the nature of the problems and policies in water resource quality management. Management of the interrelated effects of discharges of trade and sewage effluents and of diffuse sources such as rainfall, contaminated surface water, and natural organic matter, is best effected through catchment models. The concept of catchment planning is one which should help to minimize the potential effects of long and short term pollution. This concept includes the derivation of consent limits, application of development restrictions, financial investment in water and sewage treatment, and integrated monitoring programs. Such catchment planning requires a comprehensive knowledge of the toxicology of many substances, and it would therefore seem logical to maintain and improve regional and national data banks. A knowledge of the storage of bulk chemicals in the catchment is also very useful. In the past, not all direct abstraction points were provided with bankside storage, but consideration is being made for such provision at new works. Direct river abstraction points are particularly susceptible to hazards arising from short term pollution, as well as being affected by such long term pollution as nitrate. In both instances, adequate plant water treatment works should be provided to deal with the potential hazards arising in a particular catchment. Several brief case histories of catchment planning activities in Great Britain are included. (Carroll-FRC)
W81-04638

THE IMPACT ON BIRD COMMUNITIES OF THE MODERNIZATION OF SEWAGE TREATMENT WORKS,
British Trust for Ornithology (England).
R. J. Fuller, and D. E. Glue.
Effluent and Water Treatment Journal, Vol 21, No 1, p 27-31, January, 1981. 1 Fig, 2 Tab, 19 Ref.

Descriptors: *Waste water facilities, *Birds, *Environmental effects, Ecological effects, Wetlands, Lagoons, Land disposal, Great Britain.

The main ornithological characteristics of the obsolete sewage farms in Great Britain are described, and the ornithological potential of modern sewage works is discussed. Sewage treatment systems in Breat Britain have provided some of the most spectacular examples of birds utilizing human artifacts, with specialized communities associating with various components of the systems. The size of the old sewage farms was a key factor to their ornithological value, as they effectively created a complex of wet feeding sites for marsh and water birds, combined with rank herbaceous vegetation which provided nesting sites for many species. The sewage farms may have been the main British habitats for some migrant waders and were noted for concentrations of ducks, waders, and wagtails. The main ornithological loss resulting from newer sewage treatment systems has been the elimination of extensive wetland habitats. However, modern works do often attract both high densities and diversities of birds comparable to those found in woodland habitats. Percolating filters seem capable of supporting large assemblages of feeding birds throughout the year and appear to be the major focal point for bird activity around modern sewage works. Fairly large populations of breeding wetlands birds can be found on irrigation plots. The development of scrub on waste ground around the treatment plant also seems to contribute to interesting bird life. (Carroll-FRC)
W81-04639

5D. Waste Treatment Processes

CONTACT CHAMBER AERATION EFFECTS ON EFFLUENT DISINFECTION,
Hawaii Univ., Honolulu. Water Resources Research Center.
S. M. Iwamoto, M. J. Chun, R. H. F. Young, and G. L. Dugan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-23147, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No 137, March, 1981. 40 p 19 Fig, 22 Tab. OWRT-A-076-HI(1), 14-34-0001-9013, 0113.

Descriptors: *Chlorination, *Disinfection, *Coliforms, Aeration, Sewage treatment, Mixing, *Hawaii, *Chlorine contact chamber, Chlorine dosages, Mililani WWTP, Oahu.

The most common method of disinfecting waste water effluent is by chlorination which destory pathogenic microorganisms in the waste stream. A field study conducted at at the Wahiawa Wastewater Treatment Plant on the island of Oahu, Hawaii was established to determine the effect of aeration on disinfection efficiency in the chlorine contact chamber. A range of chlorine dosage was applied to the waste water entering the contact chamber for aeration rates of 0, 2.36, and 4.72, std. m3/s (0, 5, and 10 std. cfm) of air . The chlorine demand and chlorine requirement of the waste water was then determind by measuring the chlorine residual and fecal coliform concentration in the effluent leaving the chlorine contact chamber. The addition of aeration into the chlorine contact chamber enhanced the disinfection efficiency of chlorine, while its effect on chlorine residual loss in the contact chamber was not readily apparent; however, a greater drop in the chlorine residual was observed for higher chlorine dosages during periods of aeration, in comparison to nonaerated conditions.
W81-04305

DENVER TRAINS SEWAGE CONTROL STAFF IN COMPUTERIZED SYSTEM,
Metropolitan Denver Sewage Disposal District No 1, CO.
J. K. Nelson, and B. B. Mishra.
Water and Wastes Engineering, Vol 17, No 3 p 21-22, 44, March, 1980. 1 Fig.

Descriptors: *Computer, *Automatic control, *Data processing, *Waste water treatment, Digital computers, Control systems, Remote control, Denver, Colorado, Operation and maintenance, Training.

Although digital computers are commonly used in the waste water treatment field for data logging and processing, process control is a relatively recent application. The Metropolitan Denver Sewage Disposal District No. 1 is successfully operating a newly designed direct digital control system to provide closed loop real time control for their 42 mgd primary treatment facility as well as a pure oxgen activated sludge process and anaerobic digesters. Equipment consists of field mounted instrumentation (sensors, etc.), panel mounted instrumentation, remote distributed processors, and central control system (process control computer and data processing computer). In the 22 months of operation, the direct digital control system has proved useful in its dual function--data aquisition and process control. Operations personnel have been freed from manually collecting process data and can devote their efforts to monitoring and inspecting equipment. Although cost advantages of the system are minimal because more talented manpower is required, there are other advantages: easy implementation of control strategy changes, easy experimentation with advanced control techniques, prompt handling of data in any desired format, central locations, and low cost implementation of computer control for non-automated processes. A planned $390,000 expansion program to provide computer control for additional plant processes is expected to save $132,000 annually. The controls system staff can absorb any extra duties, and the plant operation staff can be reduced. (Cassar-FRC)
W81-04312

DESIGN OPTIMIZATION OF THE CHLORINATION PROCESS; VOLUME II: COMPARISON OF ACUTE TOXICITY OF CHLORINATED EFFLUENTS FROM OPTIMIZED AND EXISTING FACILITIES,
California State Dept. of Fish and Game, Rancho Cordova. Water Pollution Control Lab.
B. J. Finlayson, J. L. Nelson, and R. J. Hansen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-118051, Price codes: A06 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-80-133, August, 1980. 122 p, 19 Fig, 6 Tab, 23 Ref, 9 Append.

Descriptors: *Waste water treatment, *Chlorination, *Disinfection, *Toxicity, *Effluents, Pilot plants, Design criteria, Ammonia, Residual chlorine, Water pollution control, Fish.

A chlorine optimization study was used to investigate several design criteria that may improve the efficiency of waste water chlorination systems and hence, provide adequate disinfection without excessive chlorination and toxicity. The study was conducted onsite at eight waste water treatment plants in northern California. Two mobile units were constructed for the project: a pilot chlorination plant and a mobile toxicity testing and water quality laboratory. The pilot chlorination plant tested several optimized chlorination design criteria against existing waste water treatment plant chlorination systems. The mobile laboratory evaluated the toxicity of the optimized and existing chlorinated effluents. The toxicity to fathead minnows and golden shiners associated with the existing unchlorinated and dechlorinated effluents increased with un-ionized ammonia concentrations. Most of the toxicity associated with the unchlorinated and dechlorinated effluents, however, was the result of an artificial increase in pH created by a toxicity test design problem. The optimized chlorinated effluents, with one exception, had lower and more stable chlorine residuals than did the existing chlorinated effluents and hence, were generally less toxic. The toxicity of all effluents investigated increased proportionately with increased chlorine residual. (Brambley-SRC)
W81-04378

EVALUATION OF OPERATION AND MAINTENANCE FACTORS LIMITING MUNICIPAL WASTE WATER TREATMENT PLANT PERFORMANCE; PHASE II,
M and I, Inc., Fort Collins, CO.
B. A. Hegg, K. L. Rakness, J. R. Schultz, and L. D. DeMers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-112864, Price codes: A08 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-80-129, August, 1980. 169 p, 27 Fig, 22 Tab, 9 Ref, 8 Append.

Descriptors: *Waste water treatment, *Maintenance, *Process control, *Waste water facilities, *Design criteria, Engineering personnel, Training, Aerators, Clarifiers, Activated sludge process, Aerobic digestion, Poisons.

In Phase II of a project to identify, quantify, and rank the causes of poor performance of waste water treatment plants, the data base was extended to 50 plants in nine states. The identified highest ranking causes of limited plant performance reflect an inability of in-plant personnel to optimize process control and the performance of existing facilities. Many design features also ranked high among performance-limiting factors and reflect the con-

struction of many incomplete and marginally operable facilities. Inadequate design and the high ranking of improper technical guidance concerning process control by design engineers, regulatory personnel, equipment manufacturers, training personnel and other authoritative sources indicate the plant performance problem is not a uniquely local problem but rather industry-wide. Findings indicate the performance of each plant is typically limited by a unique combination of problems which require individual identification and elimination. The Composite Correction Program (CCP) introduced and demonstrated in Phase I, was conducted in Phase II at selected facilities to demonstrate improved performance and to further illustrate the implementation of this approach. Areas of special evaluation in the Phase II effort include aerator and clarifier design, sludge production in activated sludge plants, aerobic digester operation, reference materials used in treatment plants, operator time and tasks before and after a CCP, and the effects of toxic substances on well-operated treatment facilities. (Brambley-SRC)
W81-04379

COST COMPARISONS OF TREATMENT AND DISPOSAL ALTERNATIVES FOR HAZARDOUS MATERIALS; VOLUMES I AND II,
SCS Engineers, Redmond, WA.
W. G. Hansen, and H. L. Rishel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-128514, Price codes: A12 in paper copy, A01 in microfiche. Environmental Protection Agency Project Summary EPA-600/S2-80-188, February, 1981. 5 p, 3 Tab.

Descriptors: *Industrial waste water, *Waste water treatment, *Cost analysis, *Waste water disposal, Chemical industry, Electroplating, Capital costs, Maintenance costs, Operating costs, Hazardous materials, Metal-finishing wastes.

Life cycle cost information is an important element in selecting hazardous waste treatment and disposal technologies. The technologies and costs of wastes from the inorganic chemicals industry, organic chemicals industry, and the electroplating and metal finishing industries are evaluated for 16 alternative treatment and 5 alternative disposal methods. Capital and operation/maintenance costs were calculated for each process by using computer models. Final cost comparisons of treatment and disposal technologies for similar waste streams were then made. Risks associated with each technology were quantitatively assessed in terms of susceptibility to catastrophic events unexpected downtime, and adverse environmental impacts. The 21 treatment or disposal technologies include: precipitation, coagulation, flocculation, sedimentation; filtration; evaporation; distillation; flotation; oil/water separator; reverse omosis; ultrafiltration; chemical oxidation/reduction; hydrolysis; aerated lagoon; trickling filter; waste stabilization pond; anaerobic digestion; carbon adsorption; activated sludge; evaporation pond; incineration; land disposal; chemical fixation; and encapsulation. (Moore-SRC)
W81-04385

CONTROL STRATEGIES FOR THE ACTIVATED SLUDGE PROCESS,
Clemson Univ., SC. Dept. of Environmental Systems Engineering.
T. K. Keinath, and B. S. Cashion.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-110900, Price codes: A08 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-80-131, August, 1980. 173 p, 56 Fig, 2 Tab, 9 Ref, 4 Append.

Descriptors: *Automation, *Activated sludge process, *Pilot plants, *Process control, *Waste water treatment, Suspended solids, Computer models, Effluents, Organic matter, Retention time.

Automation of the activated sludge process may provide benefits in the form of enhanced treatment performance. Strategies to control both mean solids retention time and food to microorganism ratio were investigated. Two solids inventory control strategies were examined: control of the recycle flow rate when provision has been made for a fixed volume storage chamber; and control of the recycle flow rate when provision has been made for a variable volume storage chamber. Both strategies were evaluated by simulation using a structured model. The first strategy was also evaluated through a pilot study conducted at the Blue Plains Pilot Waste Treatment Facility. The pilot plant investigation was conducted in two phases. The first was an uncontrolled study to establish baseline conditions. The second phase was on actual application of the control study. Suspended solids that pass over the weirs of secondary clarifiers accounted for a major portion of the total carbonaceous material present in the effluent of the activated sludge process. Reductions in soluble organic material that were obtained by solids inventory control tended to be offset by increases in suspended solids passing over the weirs of the clarifier. Food-to-microorganism ratio control had no overall net benefits for the range of process operational conditions studied. (Moore-SRC)
W81-04386

PHYSICAL CHEMISTRY OF VIRUS ADSORPTION AND DEGRADATION ON INORGANIC SURFACES; ITS RELATION TO WASTE WATER TREATMENT,
Stanford Univ., CA.
J. P. Murray.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-112872, Price codes: A05 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-80-134, August, 1980. 78 p, 15 Fig, 16 Tab, 78 Ref.

Descriptors: *Enteroviruses, *Adsorption, *Metals, *Oxides, *Waste water treatment, Water pollution control, Colloids, Physicochemical properties, Kinetics, Sedimentation, Degradation, Advanced waste water treatment, Aluminum, Copper oxide, Manganese dioxide, Viruses.

The Derjaguin-Landan-Verwey-Overbeek-Lifshitz theory of colloid stability was applied to adsorption of poliovirus on oxide surfaces common in soil and aquatic environments. Excellent agreement was found between colloid stability theory and adsorption free energies calculated from mass-action principles. Colloid stability theory now provides an organized frame of reference with which to understand virus adsorption in the environment. On some surfaces, notably beta-manganese dioxide, cupric oxide and aluminum metal, kinetic analysis of data from multiple extractions and sedimentation analysis reveals that virus was actually degraded by adsorption. A column experiment also indicated that aluminum metal also effectively degraded virus in the presence of secondary waste water effluent. Adsorption by aluminum metal was not inhibited by constituents of the secondary effluent, and was more effective than granular activated carbon. It appears to have good potential for eventual use in advanced water and waste water treatment systems. (Brambley-SRC)
W81-04387

EFFECTS OF WATER CONSERVATION INDUCED WASTE WATER FLOW REDUCTION, A PERSPECTIVE,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 3D.
W81-04389

THE REMOVAL OF METALS AND VIRUSES IN ADVANCED WASTE WATER TREATMENT SEQUENCES,
Texas A and M Univ., College Station.
S. E. Esmond, A. C. Petrasek, Jr., H. W. Wolf, and D. C. Andrews.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-142630, Price codes: A12 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-80-149, August, 1980. 259 p, 76 Fig, 92 Tab.

Descriptors: *Advanced waste water treatment, *Metals, *Viruses, *Boron, Biological waste water treatment, Bacteriophage, Waste water treatment, Disinfection, Chemical treatment, Heavy metals, Chemical coagulation.

An extensive study of metals and virus removals by advanced waste water treatment processes was conducted in Dallas, Texas from June 1972 through December 1973. Processes applied to a biologically nitrified effluent included chemical coagulation with alum and/or lime, high-pH lime treatment with and without recarbonation, filtration through multi- and dual-media filters, and carbon adsorption. The high-pH lime treatment with recarbonation provided a most effective treatment for both metals removals and disinfection. Boron surfaced as a material that may require other means of control. Although high-pH lime treatment was indicated to be extremely effective for virus removal (or inactivation), metals removal were not of the same order of magnitude. Thus, efforts to control metals at points of discharge are strongly supported. The removal of some metals by biological processes appeared to be influenced by their concentration. Median values were observed to be more indicative of the plant processes than mean values. Coliphages were observed to provide essentially the same virus removals values as polioviruses. The suggestion is made that all wastes should be subject to biological treatment, and if such treatment is found ineffective, then other means of control are warranted. (Author's abstract)
W81-04391

THE EFFECT OF OZONATION OF ORGANICS IN WASTE WATER,
Colorado Univ., Denver.
W. R. Chappell, R. E. Sievers, and R. H. Shapiro.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-135360, Price codes: A07 in paper copy, A01 in microfiche. Environmental Protection Agency Project Summary EPA-600/S1-81-005, February, 1981. 3 p.

Descriptors: *Ozonation, *Waste water treatment, *Industrial waste water, Organic compounds, Sulfur compounds, Chemical reactions, Hydrocarbons, Chemical treatment, Water pollution control.

Alternative methods of water treatment which would reduce the amounts of potentially harmful organic chemicals entering potable water supplies are being considered, including ozonation. Organic constituents were identified in waste water that was treated with ozone at the Upper Thompson Sanitation District Treatment Plant, Estes Park, Colorado. The primary products of ozonation of this waste water were n-alkanes and n-aldehydes. Additional waste water from this and other sources including paper mills and chemical manufacturing facilities, was ozonated under laboratory conditions to determine the chemical effect of ozone treatment. Sulfides, sulfoxides, and phosphonate esters were destroyed by ozonation. Laboratory studies of model compounds showed that caffeine and other xanthines attacked by ozone yield triazine and imidazoline derivatives. Unsaturated hydrocarbons and derivatives yield aldehydes, alkanes, and acids. Sulfides and sulfoxides produce sulfones when treated with ozone, yet phosphonate esters are only partially oxidized. Evidence for relatively long-lived free radical species has been obtained from samples of ozonated waste water under both treatment plant and laboratory reaction conditions. (Moore-SRC)
W81-04393

A STUDY OF NITRATE RESPIRATION IN THE ACTIVATED SLUDGE PROCESS,
New York State Dept. of Environmental Conservation, Albany.
C. Beer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-110991, Price codes: A08 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-80-154, August, 1980. 167 p, 33 Fig, 45 Tab, 26 Ref, 2 Append.

Descriptors: *Activated sludge process, *Waste water treatment, *Nitrogen removal, *Denitrification, Biological waste water treatment, Aerobic treatment, Anaerobic digestion, Sludge, Surge tanks, Sedimentation.

In an experimental, 570-cu m/day (0.15-mgd) activated sludge plant treating domestic waste water from a correctional facility, 76 to 87% nitrogen removal was obtained via sludge synthesis and biological denitrification using endogenous H-donors in a compartmentalized reactor with alernating aerobic and anoxic zones. Between 27 and 48% of the influent nitrogen was removed by denitrification and between 37 and 49% via sludge synthesis. The process was operated for 8 mo under comprehensive analytical control. Ferric chloride was used to enhance phosphorus removal. The lowest winter temperature measured in the aeration tank was 15.9C. An in-line surge tank was employed for flow equalization. Primary settling was not utilized in the first 5 mo of operation during the 1974-75 winter. A turbid effluent developed in the fifth month of operation, however. This condition was finally brought under control by adding primary settling to the flow scheme and dosing ferric chloride to the influent of the primary settler. This change in treatment strategy reduced nitrogen removal from 82% to 78% by reducing sharply the amount of nitrogen removed via sludge synthesis. The portion of nitrogen removed by denitrification was not affected. This type of operation was used for 3 mo.
W81-04396

CONCENTRATION TECHNOLOGIES FOR HAZARDOUS AQUEOUS WASTE TREATMENT,
Touhill, Shuckrow and Associates, Inc., Pittsburgh, PA.
A. J. Shuckrow, A. P. Pajak, and J. W. Osheka.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-150583, Price codes: A16 in paper copy, A01 in microfiche. Environmental Protection Agency Project Summary EPA-600/S2-81-019, March, 1981. 5 p, 5 Fig.

Descriptors: *Waste water treatment, *Industrial waste water, *Waste disposal, *Water pollution control, Waste storage, Groundwater pollution, Leachate, Biological waste water treatment, Chemical treatment, Adsorption.

Contamination from unsecured industrial waste storage and disposal sites is widespread, and often manifests itself in the form of hazardous leachates and contaminated ground and surface waters. Data were compiled on the performance of unit processes for concentrating hazardous constituents of aqueous waste streams. Compounds identified in the waste streams fell into one of 12 chemical classes: alcohol, aliphatic, amine, aromatic, halocarbon, metal, miscellaneous, PCB, pesticide, phenol, phthalate, or polynuclear aromatic. Six processes were concluded to have the greatest potential range and immediate applicability: biological treatment, chemical coagulation, carbon adsorption, resin adsorption, membrane processes, and stripping. Since it was evident that in most cases no single unit process would be sufficient to adequately treat the diverse contamination problems likely to be encountered, five process trains were selected as being most broadly applicable to the types of known contamination. An analysis was then performed of the ability of each process train to treat each of three selected contamination problems. Each of these process trains has particular strengths and weaknesses. One or more of these trains should be applicable to most situations dictating concentration treatment of hazardous leachate or contaminated groundwater. (Moore-SRC)
W81-04397

TREATMENT OF PRIMARY EFFLUENT BY RAPID INFILTRATION,
Colorado Univ., Boulder.
R. B. Hartman, K. D. Linstedt, E. R. Bennett, R. R. Carlson, and L. E. Leach.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-129124, Price codes: A06 in paper copy, A01 in microfiche. Environmental Protection Agency Project Summary EPA-600/S2-80-207, January, 1981. 13 p, 10 Fig, 6 Tab.

Descriptors: *Land disposal, *Waste water treatment, *Rapid infiltration, Waste loading, Nitrates, Chemical oxygen demand, Effluent, Phosphates, Bacteria, Coliforms, Organic compounds.

Historically, land treatment systems generally have been considered acceptable only for upgrading the quality of secondary effluent discharges. The capability of a rapid infiltration system for upgrading primary effluent from a municipal waste water treatment plant is assessed, and compared with the performance obtained earlier on secondary effluent. This was done by monitoring the influent and effluent quality variations at a rapid infiltration demonstration facility over a period of one year. The site consisted of three basins ranging in size from 0.19 ha to 0.35 ha. In general, the basins operated well during the entire period of primary effluent application. Hydraulic response was somewhat improved during the primary study despite increased solids loading. As in previous years, a significant leakage of ammonium occurred during the winter months. The pattern of nitrate discharge was also unchanged from previous years, with low nitrate levels in the winter and slug discharges during the spring. All three basins demonstrated good organic removals throughout the period of primary effluent application. Effluent values from COD were generally in the 8-20 mg/l range for both study periods. Renovated water phosphate levels seldom exceeded 1.0 mg/l during the primary study. Bacterial removals in the basins were excellent, with fecal coliform removals generally in excess of 99%. (Moore-SRC)
W81-04398

ASSESSING FLOTATION BEHAVIOUR OF DIFFERENT TYPES OF SEWAGE SUSPENSION,
Toronto Univ. (Ontario). Dept. of Civil Engineering.
R. Gher, and J. G. Henry.
Progress in Water Technology, Vol 12, No 6, p Tor p1-21, 1980. 9 Fig, 11 Tab, 15 Ref.

Descriptors: *Flotation, *Waste water, Dissolved oxygen, Sludge thickening, Polymers, Aeration, *Raw waste water, Waste water treatment.

Batch and continuous flow dissolved air flotation units were used to determine the flotation performance of three suspensions: raw sewage, mixed liquor from conventional activated sludge, and mixed liquor from extended aeration. Float, effluent solids, and a thickening equation or thickening parameter were used to assess performance. Also, a dissolved oxygen meter was used to give a volue for the air available for flotation. Batch tests using a three cylinder apparatus were a convenient and accurate method for assessing flotation performance, although predictions of effluent quality were often conservative. Polymer addition was unnecessary when floating raw sewage, but was vital in the case of activated sludge mixed liquors. Sludge thickening with dissolved air flotation was most effective with conventional activated sludge mixed liquor, although the best effluent for this liquor was obtained through extended aeration. Hydraulic load was important in the case of raw sewage, and solids load controlled operation with activated sludges. (Small-FRC).
W81-04401

APPLICATIONS OF THE BUBBLE FRACTIONATION TO WATER AND WASTE WATER TREATMENT,
Societe Lyonnaise des Eaux et de l'Eclairage (France).
J. Mallevialle, M. Mietton, C. Tauzin, M. Roustan, and H. Roques.
Progress in Water Technology, Vol 12, No 6, p Tor 37-46, 1980. 4 Fig, 6 Tab, 14 Ref.

Descriptors: *Adsorption, *Bubbles, *Dye industry wastes, Detergents, *Waste water treatment, Heavy metals, Drinking water, Surfactants.

Bubble fractionation, a separation technique based on the adsorption of surface active compounds on the surface of rising bubbles, can be applied to the treatment of waste waters containing dyes, surfactants, or heavy metals and to the removal of micropollutants from drinking water. Systematic separation tests were carried out with different types of dyes. Also, organic micropollutants of industrial and agricultural origin were removed in continuous modes experiments. The technique was particularly useful in the treatment of water from a filter press, and successfully adsorbed dyes and detergents. In the production of drinking water, the technique would be particularly useful in the treatment of raw water containing detergents of a maximum concentration of 5 to 10 mg/liter. This treatment could be carried out before clarification, which would have the advantage of removing part of the halomethanes which might be present in the water. The removal of heavy metals from both drinking water and waste water seems possible. More research is needed on this low cost technique. (Small-FRC)
W81-04403

A GENERAL MODEL FOR THE ACTIVATED SLUDGE PROCESS,
Cape Town Univ. (South Africa). Dept. of Water Resources and Public Health Engineering.
P. L. Dold, G. A. Ekama, and G. R. Marais.
Progress in Water Technology, Vol 12, No 6 p Tor 47-77, 1980. 11 Fig, 2 Tab, 24 Ref.

Descriptors: *Mathematical models, *Activated sludge process, *Kinetics, Denitrification, Respiration, Aerobic digestion.

Modifications to the basic kinetic relationship in a dynamic model for the aerobic activated sludge process are described, and the model is applied to aerobic single and series reactor configurations under steady and cyclic loading conditions. Changes made in the classic model (Ekama and Marais, 1978) include replacing the energy requirement for adsorption by a bi-substrate hypothesis. Also, the extracellular growth-limiting reaction in modelled by an active site theory and replaces the modified Blackwell (1971) equation for synthesis of stored particulate substrate. A death-generation concept replaces the classical endogenous respiration concept. The modified model satisfactorily predicts the behavior of the activated sludge process operating over a long range of process configurations under constant and cyclic loading conditions. When used to predict the dynamic behavior of the single sludge denitrification process, different values are required for the kinetic constants defining the carbonaceous and ammoniacal substrate utilization rates. Also, when contact stabilization processes are modelled, a reduction in the maximum soluble substrate utilization rate at 20 deg is necessary. (Small-FRC)
W81-04404

THE EFFECT OF PARTICULATE ORGANIC MATERIAL ON ACTIVATED SLUDGE YIELD AND OXYGEN REQUIREMENT,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
W. Gujer.
Progress in Water Technology, Vol 12, No 6 p Tor 79-95, 1980. 4 Tab, 11 Ref.

Descriptors: *Activated sludge process, *Organic matter, *Mathematical models, Degradation, Decomposition, Particulate matter.

A model of the activated sludge process was developed which takes into account the removal of soluble as well as particulate organic material. Particulate organic material in primary effluent of domestic waste water treatment plantas in rapidly taken up into the activated sludge, but degradation is quite slow. This slow degradation rate increases the activated sludge yield coefficient and consequently depresses oxygen requirements. The diurnal variation of oxygen requirements is dampened by the particulate biodegradable material. By including a particulate organic fraction in activated sludge data analysis, the possibility of applying

data to a broader spectrum of problems is realized. Only careful experiments based on mass balance concept allow estimation of the degradation rate of particulate organic material. This model yielded a good approximation of experimental data, but in reality particulate organic materials are degraded at a variety of rates, not a constant rate. (Small-FRC)
W81-04405

EVALUATION OF OPERATIONAL BENEFITS TO THE ACTIVATED SLUDGE PROCESS USING STEP FEED CONTROL STRATEGIES,
Vandkvalitetsinstituter, Hoersholm (Denmark).
P. E. Sorensen.
Progress in Water Technology, Vol 12, No 6 p Tor 109-125, 1980. 9 Fig, 5 Tab, 11 Ref.

Descriptors: *Control systems, *Activated sludge process, *Aeration, Waste water treatment, Analog models, Automation, Computer, Dissolved oxygen, Performance evaluation.

Effluent quality control, energy savings, and reduced excess sludge production may result from control of the waste water feed distribution to the aeration tank in the activated sludge process. Investigations were carried out at two large parallel pilot plants, one of which was automated and one was not. Aeration control was affected by using an analog dissolved oxygen controller to adjust the blower rotation speed in order to maintain constant dissolved oxygen. The step feed control system was designed to use the blower rpm as a signal for automatic adjustment of the waste water feed distribution pattern to the aeration tank. Experiments were conducted at different F/M ratios, and the data was used to calibrate a model of the system. The plant operator was able to match the effluent quality to the conditions of the receiving water using BOD measurements. Air flow rate was used as the signal when dissolved oxygen was controlled. Accuracy was maintained only when a computer was used to compose the optimal step feed control strategy. The impact on oxygen consumption and excess sludge production was estimated for different feed patterns and different controlled BOD levels. (Small-FRC)
W81-04407

***PHYSICO-CHEMICAL TREATMENT OF* WASTE WATER--CONTROL OF REAGENT ADDITIONS BY POLLUTIONAL LOAD TO BE TREATED,**
Laboratoire Central des Ponts et Chaussees, Paris (France).
P. Marchandise, and J. P. Legendre.
Progress in Water Technology, Vol 12, No 6, p Tor 359-369, 1980. 9 Fig, 5 Tab, 3 Ref.

Descriptors: *Waste water treatment, *Flocculation, *Turbidity, Flow rate, Sewage treatment, Water pollution, Chemical oxygen demand, Flowmeters, Pilot plants, *Physicochemical treatment.

Automated addition of flocculant in waste water treatment was studied over a month period. Two types of control were compared. One method introduced flocculant in proportion to flow rate, and the second added flocculant according to the pollution load as continuously measured by turbidimeter. The second method, based on pollutional load, achieved at 73% efficiency (range 69-78%) using an average 88 mg per liter reagent at Pilot Station A and a 64% efficiency (range 38-79%) using an average 81 mg per liter reagent at Pilot Station B. The first method, based on flow rate, consumed an average 105 mg per liter reagent for an average 64% efficiency. In preliminary studies, turbidity correlated with other pollution parameters--COD and suspended matter. Flocculation jar tests established the appropriate dose of chemical to be added. Flocculants were chlorinated ferrour sulfate, a mineral flocculant, and an anionic polymer. The automated equipment consisted of a turbidimeter and flow delivering voltages varying between 0 and 100 mV, which were amplified and used to operate a dosing pump. (Cassar-FRC)
W81-04408

FLOCCULATION OF WASTE EMULSIONS USING POLYELECTROLYTES,
Swedish Inst. for Surface Chemistry, Stockholm.
D. Axberg, A-M. Wennerburg, and P. Stenius.
Progress in Water Technology, Vol 12 No 6, p Tor 371-384, 1980. 10 Fig, 2 Tab, 9 Ref.

Descriptors: *Oil wastes, *Polyelectrolytes, *Flocculation, Surfactants, Emulsions, Turbidity, *Waste water treatment, Organic wastes, Emulsifiers, Ions, Polymers, Organic compounds, Chitosan.

Three cationic polyelectrolytes (Zetag 92, Polymin SN, and Chitosan) were used to flocculate dilute oil/water emulsions of soybean oil, typical of waste water from the edible fats industry. Optimum floc formation depended on structure and charge density of the polyelectrolyte, emulsifier concentration, alkyl chain length, and ionic strength. Although all three polyelectrolytes formed flocs, Chitosan produced the strongest and largest flocs with a smaller dose than the other materials. Increasing the soybean oil level from 1000 to 4000 ppm increased the optimum dose 10-12 times. To test the effect of alkyl chain length on optimum dose, a series of alkyl sulfate emulsifiers with chain lengths of C10, 12, and 14 were interacted with Chitosan in oil emulsions. Theoptimum dose of polyelectrolyte increased with chain length--C10, 3 ppm; C12, 50 ppm; and C14, 120 ppm. Addition of NaCl broadened the range of large floc formation for C12, but drastically increased the required dose of Chitosan for C14. Under optimum conditions, turbidity of the oil emulsion was decreased by better than 99.5%..
W81-04409

THE USE OF FLOW CONTRACTIONS TO IMPROVE CLARIFIER PERFORMANCE,
Waterloo Univ. (Ontario). Dept. of Chemical Engineering.
P. L. Silverston, J. F. Cordoba-Molina, and R. R. Hudgins.
Water Science and Technology, Vol 13, No 1, p Tor 385-394, 1981. 3 Fig, 2 Tab, 10 Ref.

Descriptors: *Clarification, *Waste water treatment, *Flow control, Clarified waste water, Chemical precipitation, Filtration, Flow characteristics, Hydraulics, Flow pattern, Flow resistance.

Stratified flow theory is used to explain previously observed effects in clarifiers. Clarifier performance could be improved through the use of flow contractions that suppress internal waves and promote more uniform flow in the clarifier basin. The experiments undertaken are in line with the hypothesis of mixing induced by internal waves. The effect of flow contractions on solids removal in a clarifier was examined. Improvements from 5 to 15% were obtained in the fractional removal of solids. This means that there will be a large decrease in the discharge of suspended solids over clarifier weirs, or large increases in the capacity of the clarifier for the same degree of solids removal. These findings suggest a new approach to clarifier design and offer a class of techniques to produce better performance in both new and already-in-service units. (Baker-FRC)
W81-04410

PILOT PERFORMANCE OF DEEP U-TUBES,
Drexel Univ., Philadelphia, PA.
R. E. Speece, D. Gallagher, C. Krick, and R. Thompson.
Water Science and Technology, Vol 13, No 1, p Tor 395-407, 1981. 19 Fig, 10 Ref.

+escriptors: *Aeration, *Waste water treatment, Oxidation, Cost analysis, Dissolved oxygen, Absorption, Accumulation.

This study determined the increase in dissolved oxygen, the oxygen absorption efficiency and the head loss across a 0.1 m diameter U-tube for the following parameters: Velocity of 0.9, 1.4, 1.8m/s; depth of 12, 30, 61, 103 m; oxygen of 4, 7 1/2, 25% oxygen/water ratio; and air at 5, 15, 25% air/water ratio. The U-tube proved to be an effective oxygen absorption system at depths of 30 and 60 m. At deeper ranges of 103 m very little increase in dissolved oxygen concentrations was noted. Oxygen absorption at 90% efficiency could not be achieved in a 103 m deep U-tube even though the injection gas ratio was less than 1%. At these low gas/water ratios, there would be no effervescent loss of dissolved gas. For water containing surfactants, the oxygen absorption efficiencies would be even lower. The findings suggest that optimal oxygen transfer to tap water from air in deep U-tubes occurs at about 40 to 60 m, with a nominal water velocity in excess of 2 m/s and 15% air/water ratio. With oxygen injection, optimal oxygen transfer to tap water occurred at 25 to 60 m with a nominal water velocity in excess of 2 m/s and 15% air/water ratio. With oxygen injection, optimal oxygen transfer to tap water occurred at 25 to 60 m with a nominal water velocity in excess of 2 m/s and 25% oxygen/water ratio. (Baker-FRC)
W81-04411

DEVELOPMENT AND APPLICATION OF A TECHNIQUE FOR DETERMINATION OF THE MOLECULAR MASS DISTRIBUTION OF ORGANIC COMPOUNDS IN WATER,
Water Research Commission, Pretoria (South Africa).
O. O. Hart.
Water Science and Technology, Vol 13, No 1,1 p Tor 525-536, 1981. 5 Fig, 2 Tab, 21 Ref.

Descriptors: *Monitoring, *Organic compounds, *Waste water treatment, Reclaimed water, Water reuse, Waste water renovation, Chlorination, Activated carbon, Ozonation, Water treatment.

A technique was investigated for determining the molecular mass distribution of organic compounds in water so that the effectiveness of the unit processes for removing organic compounds could be determined, the break-through after active carbon adsorption of any group of compounds could be detected, and specific groups of compounds with possible health hazard implications might be tracked more closely. The application of the technique was tested by comparing two operational configurations of a water reclamation plant, breakpoint chlorination as opposed to ozonation for disinfection. The group of molecules with an apparent molecular mass range of 330 to 780 g/mol represented the largest percentage of total organic carbon in the water coming from all the processes of the water reclamation plant. This group of molecules was virtually unaffected by breakpoint chlorination, ozonation or active carbon adsorption. It was concluded that the molecular mass distribution pattern of organic material in water is a good indicator of the effect of various unit processes on spcific molecular mass groups. (Baker-FRC)
W81-04420

STUDY OF PARTIALLY NEUTRALIZED AQUEOUS ALUMINUM CHLORIDE SOLUTIONS: IDENTIFICATION OF ALUMINUM SPECIES AND RELATION BETWEEN THE COMPOSITION OF THE SOLUTIONS AND THEIR EFFICIENCY AS A COAGULANT,
Centre de Recherche sur la Valorisation des Minerais, Nancy (France).
J. Y. Bottero, J. E. Poirier, and F. Fiessinger.
Water Science and Technology, Vol 13, No 1, p Tor 601-612, 1981. 11 Fig, 2 Tab, 17 Ref.

Descriptors: *Coagulation, *Waste water treatment, Water treatment, Chlorides, Aluminum, Chemical coagultion, *Aluminum chloride solutions.

Aluminum chloride solutions with various aging times and degrees of neutralization were prepared. Active species were then identified. Attempts were made to relate the species present to their efficiency for the coagulation of bentonite suspensions. The higher the degree of neutralization, the more efficient was the coagulation activity. Efficiency was also improved by aging the solutions up to 24 hr. A polymer with 13 atoms of aluminum was identified, but the solution efficiency seemed to be mainly related to the presence of gel-like particles of Al(OH)3 with a size in the range of 200 Angstroms. By adjusting the preparation conditions, it

would thus seem possible to optimize the efficiency of aluminum chloride coagulant solutions. (Baker-FRC)
W81-04422

ACTIVATED CARBON PROCESSES FOR THE TREATMENT OF CHROMIUM (VI)-CONTAINING INDUSTRIAL WASTE WATERS,
Delaware Univ. Newark. Dept. of Civil Engineering.
A. R. Bowers, and C. P. Huang.
Water Science and Technology, Vol 13, No 1, p Tor 629-650, 1981. 13 Fig, 4 Tab, 35 Ref.

Descriptors: *Activated carbon, *Chromium, *Waste water treatment, Metal-finishing wastes, Metallurgy, Metals, Heavey metals, Adsorbents, Pigments, Tannery wastes, *Industrial wastes.

Various systems were examined for their abilities to remove chromium (VI) from the metallurgical and metal finishing industries, with other contributors to the problem being pigment manufacturers, leather tanneries and industries employing chromium compounds as corrosion inhibitors in cooling and boiler water. The use of activated carbon to remove chromium (VI) is a complicated process involving adsorption and reduction of CR(VI) and precipitation and/or adsorption of Cr(III). Although mixed batch reactors, CFSTR reactors and packed columns can be manipulated through design and operation to accomplish the desired degree of total chromium removal, it appears that rotating granular carbon disks show great promise as a simple, effective and economical treatment system for total chromium removal. The major merits of a rotating activated carbon disk include the fact that no further activated carbon separation is needed, as the activated carbon is already separated from the solution, that the operational arrangements for pH adjustment and Cr(III) removal are not needed, and that the system is economically comparable to a packed column treatment system. (Baker-FRC)
W81-04424

THE REMOVAL OF NITROGEN FROM AN INORGANIC INDUSTRIAL EFFLUENT BY MEANS OF INTENSIVE ALGAL CULTURE,
AECI Ltd., Johannesburg (South Africa). Research Dept.
F. Hendricks, and J. Bosman.
Water Science and Technology, Vol 13, No 1, p Tor 651-665, 1981. 5 Fig, 3 Tab, 12 Ref.

Descriptors: *Nitrogen removal, *Algal growth, *Waste water treatment, Nitrogen, Industrial wastes, Algal harvesting, Reclaimed water, Waste water renovation, Water use, Denitrification, Aquaculture.

This paper deals with the first phase of the development of an algal process for treatment of an inorganic nitrogenous effluent. The waste water at the Modderfontein nitrogen complex originates from boiler water blowdowns, storm water, cooling water purges and plant washings. This effluent combines with an incoming fresh water stream and follows a natural watercourse including two storage dams before discharging into the river. The sencond storage dam is suitable for biological treatment. The study showed the multistage algal culture system to be a technically feasible approach to nitrogen removal. There is an optimum economic balance, however, between the cost of interstage harvesting for a multistage process and the cost of additional pond area for a single stage process with shallower depth. The most important design considerations were that residence time required be determined by the nitroen removal rate/productivity, and that there be a range within which the nitrogen removal rate/productivity is at a maximum. Algal productivity depended on light and temperature but was independent of pond depth. The depth of the pond, however, is important in controlling culture density. A multistage system was needed to remove the required amount of nitrogen from the water. During winter the temperature an length of day limited productivity. (Baker-FRC)
W81-04425

BIOLOGICAL NITROGEN CONTROL OF COKE PLANT WASTE WATERS,
Environmental Protection Service, Burlington (Ontario). Waste Water Technology Centre.
T. R. Bridle, W. K. Bedord, and B. E. Jank.
Water Science and Technology, Vol 13, No 1, p Tor 667-680, 1981. 10 Fig, 8 Tab, 21 Ref.

Descriptors: *Denitrification, *Waste water treatment, Sludge disgestion, Adsorption, *Activated carbon, Coke plant waste water, *Industrial waste.

The efficiency of the pre-denitrification-nitrification flowsheet for the treatment of coke waste waters was evaluated during bench scale studies. Waste water used in this study was comprised of limed ammonia still effluent and light oil interceptor waste water taken from a steel foundry. Complete nitrification and denitrification was achieved at anoxic and aerobic hydraulic retention times of one and three days, provided dilution at 4:1 was maintained or powdered activated carbon was added to the feed at 33 to 50 mg/l. Minimum aerobic solids retention time needed to achieve complete nitrification of the diluted waste water at 22 to 24 degrees was 22 days. The addition of powdered activated carbon at 50 mg/l overcame Nitrobacter inhibition. It is noted that the organic carbon present in the waste water can be used as the energy source and electron donor for the denitrification reaction. No supplemental organic carbon is needed provided the feed filtered organic carbon/TN ratio is greater than 3.5. (Baker-FRC)
W81-04426

ADSORPTION AND ION EXCHANGE PROCESSES FOR TREATMENT OF WHITE WATER AND WASTE WATER OF PAPER MILLS,
Papiertechnische Stiftung, Munich (Germany, F.R.). Water and Waste Water Research Lab.
C. H. Mobius.
Water Science and Technology, Vol 13, No 1, p Tor 681-695, 1981. 7 Fig, 10 Tab, 15 Ref.

Descriptors: *Pulp and paper industry, *Waste water treatment, Industrial wastes, Adsorption, Ion exchange, Anion exchange, Cation exchange.

Possible methods of decreasing the organic matter content in waste water from pulp and paper mills are considered. It was shown to be possible to eliminate a substantial part of the troublesome organic substances from paper mill white water and a high degree of colored lignin compounds from biologically treated paper mill waste water by using specific adsorbents or macroporous anion exchangers. Use of a one step process adsorbent is less efficient than use of ion exhangers. Efficiency can be increased by using multi-step processes. The costs of adsorbent treatment are in the range of a few cents/cubic meter, while the overall costs of the more efficient ion exchange process may be in the range of 0.2 to 0.5 US dollars/cubic meter. Adsorbents of opposite surface charge may sometimes work equally well. But when more anionic substances are present, the positively charged adsorbent with equally good surface characteristics will work better. Only basic (anion) exchangers with pores sufficiently large to exchange ions with a molecular weight of about 10,000 can be used. The adsorbents should have a high specific surface, high pore volume and a hydrophilic surface. A positive surface charge is desirable, but a negative charge can be compensated for. (Baker-FRC)
W81-04427

INORGANIC MERCURY-BITUMINOUS COAL SORPTION INTERACTION IN WATER,
Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering.
M. P. Pandey, and M. Chaudhuri.
Water Science and Technology, Vol 13, No 1, p Tor 697-711, 1981. 9 Fig, 19 Ref.

Descriptors: *Mercury, *Sorption, *Coal, *Waste water treatment, Kinetcis, Ion exchange, Laboratory studies, Water treatment, Spectrometry.

Possible use of sorption of inorganic mercury on bitminous coal was studied as a method for a coal based process for removing mercury from water. The sorption of mercury was dependent on temperature and was reduced with rising pH as well as with chloride and calcium concentrations. Reversible first-order reaction described the batch sorption kinetics, and the equilibria were described by the Freundlich equation. A rapid interaction was noted involving mercury species and the active sites on the external coal surface. Intraparticle diffusion of mercury then occurred, for a further reaction. The desorption and regeneration data of mercury-loaded coal indicated the ion-exchange nature of the sorption reaction, apart from the possible contribution of an even stronger interaction such as hydrogen bonding or chemisorption. Such interactions were also suggested by the high activation energy which was involved. Hydrogen bonding was supported by the IR spectra of the coal with and without sorbed mercury. (Baker-FRC)
W81-04428

EVALUATION OF ACID-FAST BACTERIA, CANDIDA ALBICANS, ENTERIC VIRUSES AND CONVENTIONAL INDICATORS FOR MONITORING WASTE WATER RECLAMATION SYSTEMS,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5A.
W81-04434

EFFICIENCY OF ULTRAFILTRATION FOR THE ISOLATION OF ENTERIC VIRUSES AND COLIPHAGES FROM LARGE VOLUMES OF WATER IN STUDIES ON WASTE WATER RECLAMATION,
National Inst. for Water Research, Pectoria (South Africa).
For primary bibliographic entry see Field 5A.
W81-04436

RENTED EQUIPMENT AVERTS POLLUTION PROBLEM,
Central Contra Sanitation District, Walnut Creek, CA.
D. Niles.
Public Works, Vol 112, No 3, p 92, March, 1981.

Descriptors: *Waste water treatment, *Steam turbines, *Mechanical failure, Mechanical equipment, Management planning, Water pollution control, Water treatment facilities.

A gas explosion in the steam generation unit halted the routine operation of Central Contra Sanitary District's water pollution control/reclamation plant. The partially treated effluent was disverted into holding basins with a capacity of three days flow. Because the damage to plant turbines was extensive, the facility rented two 20,000 lb/hr, 250 psi trailer mounted boilers. The weatherproof boiler were located on-site four hours after the call was made. The rental boilers were kept in place until repairs and inspection of the plant unit were completed, about six weeks later. Throgh fast delivery of the equipment and late night labor of plant personnel, a serious environment problem was averted. Without the rental boilers, partially treated effluent would have flowed into San Franciso Bay. (Small-FRC)
W81-04470

EFFECT OF ORGANIC CHEMICALS ON CLAY LINER PERMEABILITY; A REVIEW OF THE LITERATURE,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
For primary bibliographic entry see Field 8D.
W81-04494

THE APPLICATION OF SEPARATION PROCESSES IN THE METAL FINISHING INDUSTRY,
CENTEC Corp., Fort Lauderdale, FL.
P. Crampton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-191900, Price codes: A08 in paper copy, A01 in microfiche.

In: Third Conference on Advanced Pollution Control for the Metal Finishing Industry, Kissimmee, FL. April 14-16, 1980. EPA Report EPA-600/2-81-028, February, 1981. p 23-29, 16 Fig.

Descriptors: *Metal-finishing wastes, *Industrial wastes, *Waste water renovation, *Waste recovery, *Water conservation, Water reuse, Recycling, Ion exchange, Reverse osmosis, Evaporation, Electrodialysis.

The economic incentive for making more efficient use of energy, water, and raw materials is significantly greater for metal finishing firms than it was in the past. Processes which recycle raw materials from what were formerly waste streams have found increasing use. These processes have in common the ability to separate specific compounds from a water solution, yielding a concentrate of those compounds and relatively pure water. The processes which have enjoyed the broadest commercial success in this area include evaporation, ion exchange, reverse osmosis, and electrodialysis. Plating chemical recovery is the only commercially significant application of evaporation in the metal finishing industry. Cost effective utilization of evaporative recovery can be realized in many cases by direct drag-out recovery to make up for plating bath surface evaporation, or augmenting surface evaporation with low cost, low capacity batch evaporators. Ion exchange is a versatile separation process which has found application for: concentration of plating chemical dragout for recycle to plating bath and rinse water reuse, waste water treatment, mixed waste water deionization and water reuse, polishing after conventional waste water treatment, purification of spent acids, and water supply deionization. Membrane processes utilized in the plating industry include reverse osmosis and electrodialysis. Both processes are continuous, come in compact modular units, and have low operating costs over a broad range of loading conditions. Both processes are being applied for drag-out recovery from plating rinse waters. Another application of reverse osmosis is mixed waste water purification with recycle of permeate and treatment of the concentrate. (Moore-SRC)
W81-04506

EPA'S CENTRALIZED TREATMENT PROGRAM,
Industrial Environmental Research Lab., Cincinnati, OH.
A. B. Craig, Jr., and G. C. Cushnie, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-191900, Price codes: A08 in paper, A01 in microfiche. In: Third Conference on Advanced Pollution Control for the Metal Finishing Industry, Kissimmee, Florida, April 14-16, 1980. Environmental Protection Agency Report EPA-600/2-81-028, February, 1981. p 115-131, 13 Fig, 27 Tab.

Descriptors: *Metal-finishing wastes, *Waste water treatment, *Industrial waste water, *Feasibility studies, Economics of scale, Model studies, Computer model, Financial feasibility, Electroplating, Metals.

Pollutants in metal finishing process waste water interfere with proper operation of biological treatment systems in Publicly Owned Treatment Works and restrict the use of biological sludges because of their high content. Because of the potential impact of compliance with pending waste water pretreatment and solid waste disposal regulation on industry, conceptual alternatives to on-site industrial waste treatment are being investigated. One promising alternative is centralized treatment, the primary assets of which are scale economy and improved waste management. Five case study areas were chosen to represent varying situations in which centralized waste treatment (CWT) would be applicable: Milwaukee, Seattle, Cleveland, Atlanta, and Philadelphia. To determine the feasibility of CWT in each area, data were gathered and an analysis was performed using a microcomputer model. In order to demonstrate the approach necessary for implementation of central treatment, a comprehensive metal finishing waste control plan was developed for Cleveland. The plan includes a CWT system configuration with collection, transportation, treatment and disposal; on-site treatment requirements; financing requirements and alternatives; and management options. (Moore-SRC)
W81-04510

GROUP TREATMENT - OPTIONS AND ECONOMICS,
E. W. Salomon, and E. H. Comfort.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-191900, Price codes: A08 in paper copy, A01 in microfiche. In: Third Conference on Advanced Pollution Control for the Metal Finishing Industry, Kissimmee, Florida, April 14-16, 1980. Environmental Protection Agency Report EPA-600/2-81-028, February 1981. p 135-144, 7 Fig, 8 Tab, 11 Fig.

Descriptors: *Industrial waste water, *Electroplating, *Metal-finishing wastes, *Economic feasibility, *Waste water facilities, Economies of scale, Financing, Waste water collection.

The metal finishing industry, because the nature of its waste discharge is such that it can seriously interfere with the proper operation of Publicly Owned Treatment Works, will be one of the industries most affected by waste water pretreatment regulations. Various process waste water control and treatment technologies will be required, which could have an adverse economic effect, especially for small plants. Group treatment is one alternative whereby firms may achieve the benefits of economy of scale. A preliminary study of the concept as applied to the plating firms within Huntington Industrial Park, Providence, Rhode Island, was conducted. It was found that, with the assumed ten participating firms, substantial savings could be realized. The effects of financing cost and waste water hauling charge on savings achieved were investigated, as were the benefits of installation of a piped waste water collection system. The most cost-effective decision for each participating firm was identified. Installation of an industrial sewer system within the park, while more than doubling the demands for initial capital, would be cost-effective in the long run. An approach to financing the proposed facility is outlined. (Moore-SRC)
W81-04512

MEMBRANE SEPARATION OF ORGANICS FROM AQUEOUS SOLUTIONS,
Monsanto Co., St. Louis, MO. (Assignee).
E. Perry.
US Patent No 4,218,312, 7 p, 3 Tab, 4 Ref; Official Gazette of the United States Patent Office, Vol 997, No 3, p 990, August 19, 1980.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Organic wastes, *Separation techniques, Membrane processes, Chemical potential, Membrane separation.

Organics selected from alkanols, alkyl benzenes and organic nitriles are separated from aqueous solutions by contacting the aqueous solution feed with a first surface of a polymeric membrane comprised of an aliphatic nylon selectively permeable to organic components; while maintaining a second and opposite membrane surface at a lower chemical potential than the first membrane surface for the organic components, permeating a portion of the organic components into and through the membrane; and withdrawing from the second membrane surface a mixture having a higher total concentration of organic components than the organic components concentration of the aqueous solution feed stream. (Sinha-OEIS)
W81-04514

OXIDATION AND ADSORPTION METHOD FOR REMOVING CONTAMINATING SUBSTANCES FROM LIQUIDS,
K. H. Hartkorn.
US Patent No 4,218,315, 6 p, 3 Fig, 16 Ref; Official Gazette of the United States Patent Office, Vol 997, No 3, p 991, August 19, 1980.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Separation techniques, Oxidation, Adsorption, Electrochemistry, Coagulation, Organic wastes.

The specification describes an oxidation and adsorption method for removing contaminating materials (pollutants) from aqueous liquids. The liquids are first subjected to an electrochemical treatment for the purpose of coagulation or agglomeration and partial oxidation by addition of NaOCl. Following this, using sedimentation and/or flotation, the agglomerated and coalesced sludge is removed. In the liquid an excess of OCl - remains and this liquid, enriched in this manner, is supplied to adsorption columns, in which inorganic adsorption compositions are locating having a high specific surface area so that a further oxidation is achieved by the excess OCl-, together with a partial adsorption and by addition of O3, complete oxidation is achieved. The organic contaminating materials are converted into CO2 products of adsorbing materials of different grain sizes and specific surface areas made of inorganic materials, following which the CO2 escapes from the liquid and is stored. The thus cleaned liquid then leaves the oxidation and adsorbing columns. (Sinha-OEIS)
W81-04515

METHOD OF CLARIFYING AND REMOVING WATER FROM WATER-SOLIDS SUSPENSIONS,
Halliburton Co., Duncan, OK. (Assignee).
J. L. Watson, and P. L. Totten.
U.S. Patent No 4,218,316, 6 p, 2 Tab, 8 Ref; Official Gazette of the United States Patent Office, Vol 997, No 3, p 991-992, August 19, 1980.

Descriptors: *Patents, *Waste water treatment, *Pollution abatement, Suspended solids, Separation techniques, Flocculation, Drilling fluids, Screens.

At the end of the drilling procedure, the aqueous drilling fluid containing suspended solid materials must be disposed of. By this invention an improved method of clarifying and removing water from water-solids suspensions is provided whereby the required quantity of clarified water is removed immediately after forming the suspended solids into flocculent masses. The methods comprises the steps of dispersing at least one or more of a particular class of a solids flocculating additive into the suspensions in an amount sufficient to form the suspended solids into flocculent masses of a particular size, and then withdrawing water from the sump through a screen of a size which prevents the flocculent masses from passing through and clarified water is continuously removed from the sump. (Sinha-OEIS)
W81-04516

PROCESS AND APPARATUS FOR TREATING AND PURIFYING WASTE WATER,
T. Niimi, M. Niimi, and T. Arimizu.
U.S. Patent No 4,218,318, 10 p, 11 Fig, 17 Ref; Official Gazette of the United States Patent Office, Vol 997, No 3, p 992, August 19, 1980.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Water purification, Soil environment, Soil microorganisms, Flow, Equipment, Aeration.

An apparatus for treating and purifying waste water comprises a long and shallow waste water treatment tank having an opening at the upper end and being filled with sand gravel covered with a convex net covered with aerated soil. The tank is positioned dozens of centimeters below the surface and is provided with: an inlet for waste water, a conduit in the base of the tank connected to the inlet, perforated plates overlaying the conduit and supporting the sand gravel filling the tank, a perforated pipe for supplying air arranged under the perforated plates, and an outlet for treated waste water at the surface of the sand gravel layer covered with a convex net. The waste water will be purified, removing environmental pollution such as offensive odor and pathogens by making use of processes in which the fluid fluctuates repeatedly in fluid-gas flow in the tank, in addition to maximum utilization of activities of useful soil organisms. (Sinha-OEIS)
W81-04518

METHOD AND APPARATUS FOR DISPOSAL OF ORGANIC WASTES,
N. A. Nassef, and L. E. Streebin.
U.S. Patent No 4,219,415, 8 p, 5 Fig, 11 Ref; Official Gazette of the United States Patent Office, Vol 997, No 4, p 1377, August 26, 1980.

Descriptors: *Patents, *Waste water treatment, *Organic wastes, Separation techniques, Filtration, Microwaves, Activated carbon, Equipment.

A method and apparatus disposes of aqueous organic wastes by filtration and microwave irradiation. The aqueous organic waste is placed on a moving activated carbon filter bed, and during the bed movement, the liquid in the waste is substantially separated from the solid organic matter. In the course of separation, and during movement of bed, both the liquid and organic solid matter are irradiated with microwaves and are thereby stabilized and sterilized. A portion of the sterilized organic solid residue is stored, and is subsequently converted to activated carbon to be used in the filter bed. (Sinha-OEIS)
W81-04524

PROCESS FOR RECOVERING MOLYBDENUM AND TUNGSTEN FROM MINING WASTE WATER,
Dravo Corp., Pittsburgh, PA. (Assignee).
E. R. Ramirez, and G. Ramadorai.
U.S. Patent No 4,219,416, 4 p, 18 Ref; Official Gazette of the United States Patent Office, Vol 997, No 4, p 1378, August 26, 1980.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Mine waters, *Separation techniques, Electrolysis, Chemical precipitation, Flotation, Bubbles, Heavy metals, Molybdenum.

It is an object of the invention to provide an improved process for treating mining waste waters to remove molybdenum and tungsten values. It is also an object to provide an improved process for forming insoluble complexes of molybdenum and tungsten within the waste waters, and thereafter removing them by gas flotation with electrolytically generated microbubbles. Generally the objects of the invention are carried out by a selective precipitation of anionic metal complexes within a narrow pH range of between about 2.0 and 6.0, followed by gas flotation. The process is amenable to any aqueous medium containing heavy metal values in their anionic form, but is primarily directed to the treatment of mining waste water, such as mine water tailings, that contain trace amounts of heavy metals. (Sinha-OEIS)
W81-04525

WASTE WATER FLOTATION UTILIZING STREAMING POTENTIAL ADJUSTMENT,
Dravo Corp., Pittsburgh, PA. (Assignee).
E. R. Ramirez.
U.S. Patent No 4,219,417, 12 p, 5 Fig, 1 Tab, 6 Ref; Official Gazette of the United States Patent Office, Vol 997, No 4, p 1378, August 26, 1980.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Water purification, Separation techniques, Flotation, Bubbles, Zeta potential, Food processing industry.

This invention is an improved method for clarifying waste waters by flotation. A flow of waste water containing charged particulate matter is adjusted to near its zero streaming potential value by adding a non-coagulant. The adjusted waste water flow is then directed to a confined location containing dense quantities of small bubbles. The overflow from the confined location enters a flotation zone having a partially baffled flow and also a quiescent zone at its downstream end. Positioned above both the confined location and the flotation zone is a floc removal means, the clarified waste water exiting downstream of the quiescent zone. In one embodiment, these features are combined with forming the bubbles by electrolytic decomposition of water to accomplish an improved simultaneous passage of ions from the waste water into the floc. (Sinha-OEIS)
W81-04526

WATER TREATMENT PROCESS,
J. Pilon.
U.S. Patent No 4,219,418, 6 p, 1 Fig, 2 Tab, 8 Ref; Official Gazette of the United States Patent Office, Vol 997, No 4, p 1378, August 26, 1980.

Descriptors: *Patents, *Waste water treatment, *Water polluion treatment, *Industrial wastes, *Pulp and paper industry, Water purification, Flocculation, Filtration, Chlorination, Potable water.

A process for the purification of highly polluted water containing paper mill waste products and algae is described. The process comprises: (a) treating highly polluted water with hydrogen peroxide and alum; (b) allowing flocculation and then sedimentation to take place, while pre-chlorinating the treated water by subjecting it to the action of chlorine during flocculation or after sedimentation, or both; (c) filtrating the resulting water to remove solid particles still in suspension; and (d) post-chlorinating the filtrated water by treating it with a liquid composition obtained by mixing chlorine, an alkali metal chlorate and a non-toxic mineral acid. The water treatment process enables one to obtain a drinking water which is colorless, odorless and from which bad tastes have been eliminated. (Sinha-OEIS)
W81-04527

TREATMENT OF REDUCIBLE HYDROCARBON CONTAINING AQUEOUS STREAM,
Envirogenics Systems Co., El Monte, CA. (Assignee).
K. H. Sweeny.
U.S. Patent No 4,219,419, 9 p, 4 Fig, 6 Ref; Official Gazette of the United States Patent Office, Vol 997, No 4, p 1378-1379, August 26, 1980.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Organic wastes, Pesticides, Polychlorinated biphenols, Reduction(Chemical), Filtration, Hydrogen ion concentration, Equipment.

An economical process for the treatment of aqueous waste streams containing low levels of reducible organic compounds is provided. The major portion of the organic compound is decomposed to innocuous products and the treated effluent does not contain an excessive quantity of metals ions. The invention further provides several modes of contacting the stream and reagent. The dilute aqueous waste streams are treated by flowing the stream, preferably at neutral pH, through a constrained bed of reductant metal. The reductant metal bed, preferably as a metal couple containing 0.1 to 10 meq catalyst/g of reductant may be in the form of a porous sponge or wire mass, a fluidized bed or a bed diluted with particulate inert solid such as glass beads or sand so as to have a selected permeability, flow rate and retention time. The effluent usually experiences a significant reduction of toxicant, usually at least a 90% reduction and can contain 1 ppb or less of reducible organic compound. The waste treatment system generally includes filtration means, pH adjustment means, a flow controller and a column containing a restrained, permeable bed of reductant. (Sinha-OEIS)
W81-04528

APPARATUS FOR ENRICHING OXYGEN CONTAINED IN WATER,
Government Industrial Research Inst., Tokyo (Japan). (Assignee).
T. Tamura, T. Ozawa, W. Ito, N. Fujita, and N. Negishi.
U.S. Patent No 4,219,424, 15 p, 10 Fig, 6 Ref; Official Gazette of the United States Patent Office, Vol 997, No 4, p 1381, August 26, 1980.

Descriptors: *Patents, *Waste water treatment, Sewage treatment, Water pollution treatment, Oxygenation, Aerobic conditions, Oxygen, Equipment, Bubbles.

An apparatus for enriching dissolved oxygen in water comprises a number of dissolving devices, each of which comprises: (1) a pair of vertically arranged tubular bodies, the lower end of the first tubular body being provided with an inlet through which raw water is introduced and the lower end of the second tubular body being provided with an outlet for discharging oxygen enriched water; (2) a tube connecting the interior of both tubular bodies at the central part; (3) a bubbler placed in the interior of the first tubular body for flowing an oxygen enriched gas into the raw water and for moving the raw water into the second tubular body through the connecting tube; (4) a pipe for connecting the top portions of the tubular bodies which form a chamber for the gas above the liquid level of the raw water in each of the tubular bodies; (5) a means for supplying an oxygen enriched gas into the chamber of the second tubular body; and (6) a means for supplying the gas in the chambers to the bubbler. (Sinha-OEIS)
W81-04529

WATER RESERVOIR,
G. Soderstrom.
U.S. Patent No 4,219,428, 4 p, 1 Fig, 1 Ref; Official Gazette of the United States Patent Office, Vol 997, No 4, p 1382, August 26, 1980.

Descriptors: *Patents, *Waste water treatment, *Impaired water use, Surface runoff, Septic tanks, Reclaimed water, Water reuse, Equipment, Filtration, Equipment.

A water collection device is disclosed which provides a source of usable water from collected surface and waste water, and comprises three concentrically arranged compartment which function as a septic tank. The innermost compartment performs a settling function and delivers clarified water through a liquid seal to the intermediate compartment, from which it is drawn for use. Excess water in the intermediate compartment overflows into the outermost compartment, from which it is discharged as waste. (Sinha-OEIS)
W81-04530

WATER ALKALINITY CONTROL IN THE MANUFACTURE OF HYDROUS SILICATE PRODUCTS,
Owens-Corning Fiberglas Corp., Toledo, OH. (Assignee).
J. L. Helser, and W. H. Rigby, Jr.
U.S. Patent No 4,219,515, 4 p, 3 Ref; Official Gazette of the United States Patent Office, Vol 997, No 4, p 1406, August 26, 1980.

Descriptors: *Patents, *Waste water treatment, *Industrial water, *Recycling, *Water reuse, Separation techniques, Chemical precipitation, Filtration, Calcium compounds.

The water resulting from the filter press molding of slurries of hydrated lime and reactive silica in the manufacture of hydrous calcium silicate products is recycled to the process by treating it with carbon dioxide to precipitate dissolved calcium hydroxide, filtering, and returning the filtered water to the process step wherein the lime and silica are slurried in water. (Sinha-OEIS)
W81-04531

TROUBLESHOOTING PROVIDES KEY TO SEWAGE PLANT DESIGN,
American City and County, Vol 96, No 3, p 55-57, March, 1981. 2 Fig.

Descriptors: *Waste water facilities *Design criteria, *Waste water treatment, Skaneateles, New York State, Maintenance, Energy conservation, Water quality, Effluents.

Packard and Anderson, a firm located in Auburn, New York, has designed a waste water treatment plant for the resort community of Skaneateles, New York, with operation and maintenance in mind. The plant is designed to be easy to operate, easy to maintain, reliable, and inexpensive to keep that way. The 0.55 million gallon per day plant will use rotating wedge-wire screens for primary

treatment, rotating biological contactors and rectangular clarifiers for secondary treatment, an aerated lagoon for polishing, and the BIF Purifax process for sludge stabilization to accomplish 90% biological oxygen demand and suspended solids removals and partial removal of nirogen. The firm's troubleshooting experiences led it to enclose all processes in one structure, to make energy conservation a primary objective, and to make all process units simple to understand and to operate. Flexibility is built into the system, including provisions for easy access to equipment and piping and for the possibility of later expansion. There is little instrumentation in the plant, but the plant operator will have full visual control of the entire plant. (Carroll-FRC)
W81-04545

FUNDAMENTALS OF SEWER VENTILATION AS ALLIED TO THE TYNESIDE SEWERAGE SCHEME,
Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
M. B. Pescod, and A. C. Price.
Water Pollution Control, Vol 80, No 1, p 17-33, 1981. 8 Fig, 9 Tab, 6 Ref.

Descriptors: *Interceptor sewers, *Ventilation, *Hydrogen sulfide, Sewer systems, Mathematical models, Computer models, Temperature effects, Sewage gas, Oxygen, Waste water treatment, *Odor control, Howden, Great Britain.

The concentration of hydrogen sulfide (H2S) in the atmosphere of interceptor sewers arriving at the sewage treatment works at Howden, Great Britain, is important due to the proximity of a lead oxide plant which the Northumbrian Water Authority is bound by agreement to protect from exposure to even very low ambient H2S levels. A project was undertaken to achieve continual extraction of air from the sewers and replacement with fresh air so that the oxygen content of the sewer atmosphere would not be a limiting factor in reoxygenation of flowing sewage and would not contribute to the development of H2S in the interceptor sewers as they approached the treatment plant. Factors which have been identified as contributing to the natural ventilation of sewers include sewage drag, wind-across-vent extraction, difference in temperature between sewer atmosphere and surface ambient air, sewage rise and fall, and change in barometric pressure. A general model for the mass balance of oxygen in a 1-meter length of sewer, taken as an element of sewer length between one educt vent and the next, was developed and applied to the Tyneside sewerage scheme to estimate the oxygen concentration in the atmosphere of a range of sewer sizes. These studies allowed some of the fundamental factors in natural ventilation to be quantified and correlated with influencing variables. Ventilating air flows were then calculated for the interceptor sewers under varying meteorological conditions. A criterion has been suggested to allow the calculation of maximum distance between educt vents on a sewer which will prevent oxygen deficiency in the sewer atmosphere from affecting bacterial respiration in the flowing sewage. The results have been applied in the design of natural ventilation for the interceptor sewers on Tyneside. (Carroll-FRC)
W81-04547

DEWATERING MUNICIPAL SLUDGES BY OSMOSIS,
E. B. Pugsley, and C. Y. Cheng.
Water Research, Vol 15, No 3, p 395-399, March, 1981. 7 Fig.

Descriptors: *Sludge, *Dewatering, *Osmosis, Sludge drying, Sludge thickening, Primary sludge, Membrane processes, *Waste water treatment, Brines.

The dewatering of sludges to 79% or less by normal osmosis without the addition of lime or ferric chloride or other pretreatment was carried out. Sludge with 1-2% solids content was placed in contact with a semi-permeable membrane, on the other side of which was a flowing stream of highly concentrated brine. Although the work was all done at bench scale, a proposed commercial design is presented. It is noted that some sort of sludge thickening prior to the osmotic process would lessen the time in the process. Using a higher concentration of a given brine increases the dewatering rate. Of the various brines considered, LiBr was the most efficient, but was far more expensive than the others tried. NaCl was almost as good as CaCl2, but the available concentration is much less. Comparative costs of desalination of diluted brine and dicharge of effluent would have to be determined. (Baker-FRC)
W81-04552

COMMISSIONING AND OPERATIONAL EXPERIENCE AT GREAT BILLING SEWAGE-TREATMENT WORKS,
Anglian Water Authority (England). Northampton Sewage Div.
J. L. Mayman, J. Jehlicka, and L. Armstrong.
Water Pollution Control, Vol 80, No 1, p 102-116, 1981. 5 Fig, 12 Tab.

Descriptors: *Waste water facilities, *Waste water treatment, *Waste water composition, Industrial waste water, Municipal waste water, Great Britain, *Northampton.

The Great Billing Sewage Treatment Works in Great Britain serves the town of Northampton and surrounding villages, including a total population of about 160,000. The high organic load from industrial effluents treated is equivalent, in terms of chemical oxygen demand, to another 142,000 persons. This paper describes the commissioning and operating experience of extensions to the treatment facilities completed in 1974. Extensive information is provided on the characteristics of the sewage and industrial effluents; maintenance and laboratory services are described. Aspects of the inlet works which are described include screens, the incinerator, and detritors. The characteristics and operating experiences with respect to the primary settlement and automatic desludging operations, the aeration unit, the biological filtration system, the storm-sewage separation and balancing system, the odor control unit, and the digestion process are described. Digested sludge produced by the facility is applied directly to farm land maintained by the facility. Although the farming activities produce significant savings in sludge disposal costs, an intolerable strain is being placed upon the land due to serious overloading with zinc. Tankering of sludge to private farm land is anticipated in the near future. This paper was presented at a joint meeting of the East Anglian and West Midland Branches held in Northampton on June 6, 1979. Discussion of the presentation is included. (Carroll-FRC)
W81-04563

RECYCLING PROJECTS RECEIVE 'APPROPRIATE' NSF SUPPORT,
National Science Foundation, Washington, DC.
For primary bibliographic entry see Field 6B.
W81-04565

ION EXCHANGE IN NUCLEAR POWER APPLICATIONS,
Dia-Prosim SA, Vitry (France).
R. Couderc, R. J. Fletcher, and R. T. Hutchinson.
Effluent and Water Treatment Journal, Vol 20, No 9, p 431, 433-436, September, 1980. 3 Fig, 1 Tab, 4 Ref.

Descriptors: *Ion exchange, *Ion exchange resins, *Nuclear powerplants, *Waste water treatment, Nuclear reactors, Water treatment, Water pollution control, Cooling water.

Ion exchange resins are very effective in the production of high purity water for the efficient operation of nuclear power stations and their waste treatment processing plants. In graphite-moderated gas-cooled reactors, ion exchange resins are used for the production of make-up water and in the secondary circuit during high flow rate condensate purification. In boiling water reactors, conventional resins are used in the makeup section to provide water with a conductivity of 0.1 micromhos/cm at 25C. The water in this type of reactor must be kept extremely pure, and no chemicals are added. In plants using river water as coolant, microresins are employed. Microresins are also used in the ion exchange unit. In pressurized water reactors, makeup water must be of very high quality, so standard resins are supplemented with polishing units. The water quality in the condenser is controlled using deep resin beds. Primary effluent in this type of plant is often treated with ion exchangers to help produce a pure condensate. The ions must frequently encountered for removal are the isotopes of cesium, iodine, cobalt, strontium, rubidium, tellurium, molybdenum, manganese, chromium, and sodium. The resins must have a specific affinity for the dangerous cesium-137. (Small-FRC)
W81-04575

MECHANICAL AERATION VERSUS HYDROGEN PEROXIDE IN STABILIZATION POND TREATMENT,
Lagos Univ. (Nigeria).
K. L. Iwugo.
Effluent and Water Treatment Journal, Vol 21, No 1, p 8-10, 12-16, 18, January, 1981. 6 Fig, 8 Tab, 29 Ref.

Descriptors: Aerated lagoons, *Stabilization ponds, *Hydrogen peroxide, *Aeration, Mechanical equipment, *Waste water treatment, Anaerobic lagoons, Oxidation, *Zambia, Ponds, Industrial waste water, Tannery wastes, Food-processing wastes, Economic aspects, Electrical equipment.

The frequent breakdown of mechanical aerators in stabilization ponds and the intermittent nature of power supply in developing countries had led to a search for alternative sources of oxygen for aerated ponds. Laboratory investigations were conducted to evaluate the treatment of molasses-based yeast and chrome-based tannery waste waters in stabilization ponds using hydrogen peroxide and using diffused air. Hydrogen peroxide was found to be as effective as diffused air in supplying oxygen to an aerated or oxygenated lagoon. The decomposition of all the hydrogen peroxide doses into an oxygen-deficient aqueous biological medium is not instantaneous, and a substantial concentration of residual hydrogen peroxide can be maintained even after a mean residence time of about 3 days. The efficiency of conversion of hydrogen peroxide to metabolically useful oxygen appears to be higher than 50% for waste stabilization ponds systems treating strong organic wastes. Effluents produced when hydrogen peroxide was used were generally of higher quality than those which resulted when air was used as the source of oxygen. The use of hydrogen peroxide resulted in practical yields higher than 70% of such valuable products as sulfur from tannery waste waters. The high cost and local scarcity of hydrogen peroxide in developing countries may limit its use to only periods of emergency. Aerated oxygenated-faculative stabilization ponds may prove a very cost-effective method for treating organically strong industrial waste waters in developing countries. (Carroll-FRC)
W81-04576

WATER/WASTE WATER PROCESS CONTROL INSTRUMENTATION - AN OVERVIEW,
R. H. Babcock.
Water and Sewage Works, Vol 127, No 3, p 30-31, March, 1980.

Descriptors: *Control systems, Measuring instruments, Pressure-measuring instruments, Water treatment, *Waste water treatment, Reviews, Evaluation.

The state of the art in the water/waste water treatment instrumentation field is reviewed as regards design, operation, and marketing decisions for management. Some of the significant advancements made in this area include pneumatic and electronic transmitters for pressure, differential pressure level, flow temperature, etc., which operate reliably under extremes of conditions. Improved flow-measurement systems, analog and digital techniques, trend toward replacing chart recordings with a cathode-ray tube, and the re-

placement of hand-wired analog control devices with digital devices programmed for a specific control function have all served to update the various systems around the country. Even though instrumentation has advanced, care must be taken to follow correct instructions on operating conditions for the equipment. The limits of control instrumentation must be considered. (Baker-FRC)
W81-04587

THE CONSTRUCTION GRANTS PROGRAM: GETTING IT ALL TOGETHER FOR THE '80S,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 9C.
W81-04588

HOW TO USE EVAPORATIVE RECOVERY IN TREATING WASTES,
Pfaudler Co., Rochester, NY.
H. S. Hartley.
Industrial Finishing, Vol 56, No 11, p 47, November, 1980. 1 Fig.

Descriptors: *Evaporation, *Waste recovery, *Plating wastes, Recycling, Metal finishing wastes, Costs, Industrial wastes, Waste water treatment.

Evaporative recovery can be combined with waste water treatment systems to economically treat metal plating wastes. Economics for recovery can be optimized by designing the recovery system to operate with the first one or two rinse tanks, which contain high concentrations of plating chemicals. The final rinse tank(s) can be isolated from the recovery system and receive rinse water from an external source. This open-loop type system has lower investment costs and only half the operating costs of a closed-loop system. The open-loop system can recover 90-95% of the dragout. With this system, chemical treatment costs are also reduced, as are sludge handling and disposal costs. Since evaporative recovery is strictly a physical process, there are none of the costs or problems associated with chemicals. (Small-FRC)
W81-04593

WATER REUSE - AN EMERGING TECHNOLOGY,
D. R. Aukamp, and J. A. Susan.
Industrial Water Engineering, Vol 17, No 4, p 17-22, July/August, 1980.

Descriptors: *Water reuse, *Water treatment facilities, *Metropolitan water management, Drinking water, Water treatment, Performance evaluation, Washington, *District of Columbia, Waste water treatment.

The Experimental Estuary Water Treatment Plant was designed to evaluate the feasibility of treating Potomac River estuary water and effluent from the Blue Plains Waste Water Treatment Plant. The objective is to produce potable water of acceptable quality. Both series and parallel considerations were developed for different unit processes. Treatment can include: microscreening, ammonia removal, blending aeration, rapid mix, flocculation, sedimentation, predisinfection, filtration, activated carbon adsorption, post-disinfection, chlorination, ozonation, ultraviolet irradiation, dissolved solids removal, reverse osmosis, electrodialysis, and ion exchange. The basic treatment train was designed to handle a maximum flow of 1 Mgd. A sampling program has been designed which will measure: turbidity, total organic carbon, temperature, and chlorine residual. Grab samples will be used to determine dissolved oxygen and coliforms. The plant will be operated continuously for two years. The treatment plant was designed to produce emergency drinking water for the Washington, D.C. area. The treatment processes used are applicable to many waste water reuse situations. (Small-FRC)
W81-04594

REUSE OF TEXTILE DYE WASTE WATER,
A. G. Cox.
Industrial Water Engineering, Vol 17, No 4, p 14-16, July/August, 1980. 1 Fig.

Descriptors: *Water reuse, *Ozonation, *Textile mill wastes, Dye industry wastes, Costs, Performance evaluation, Pilot plants, Waste water treatment.

Ozone is a stronger oxidant than chlorine, potassium permanganate or hydrogen peroxide, and is uniquely applicable to the treatment of textile day waste water. Research pilot plant work on the use of ozone to treat textile wastes does not always agree with laboratory results. Ozone dose rates in the range 30 ppm to 50 ppm are effective in pilot plants which disagrees with published findings. This difference is attributed to the mixing provided by the turbine diffuser. In pilot plants, total use of process water was possible. Also, there was no discharge with none of the associated costs for sewage treatment, discharge permit maintenance, laboratory testing, and surcharges for overenrichment. The use of ozone permitted a 75% reduction in companion chemical costs because the ozone selectively attacks the color and destroys only a small part of chemical additives. The ozone system also effected a 60% reduction in heating costs. It is believed that an installed ozone recycle system would be entitled to fiscal incentives in the areas of Pollution Control Facilities for Rapid Amortization, Investment Credit Benefits, and Energy Tax Credit Benefits. (Small-FRC)
W81-04595

AWT: A CHICAGO SUCCESS STORY,
P. W. Prendiville, and T. McAloon.
Water/Engineering and Management, Vol 128, No 4, p 38-40, April, 1981. 3 Fig, 2 Tab.

Descriptors: *Waste water facilities, *Advanced waste water treatment, Water treatment facilities, *Chicago, Nitrogen, Suspended solids, Biological oxygen demand.

An advanced waste water treatment plant deemed necessary to protect receiving stream water quality in the Chicago area was constructed. The plant's effluent standards are stringent: BOD 4 mg/liter, with suspended solids at 5 mg/liter and ammonia nitrogen at 2.5 mg/liter. The plant design provides for two-stage biological treatment, nutrient removal, rapid dual-media filtration, and disinfection for a flow of 50 mgd, and primary treatment and disinfection for an additional 75 mgd of mixed stormwater and waste water. On leaving the grit chambers the dry-weather flow passes through two biological plants in series: one for carbonaceous BOD removal, and the other for nitrogenous oxygen demand removal by nitrification. Each plant is designed as an activated sludge plant complete with aeration and sedimentation basins. Effluent from the final sedimentation basins of the nitrification plant flows to six double compartment dual-media filters and is subsequently chlorinated and discharged through a 2-mile, 96-in diameter outfall to Salt Creek. Excess sludge is concentrated in flotation thickeners and digested in floating-cover digesters equipped with gas recirculation systems for sludge mixing. A high degree of automation was incorporated to minimize the labor needed for plant operation. During its four-year history the automatic and computerized operations have functioned satisfactorily. (Baker-FRC)
W81-04604

FEASIBILITY STUDY UNDERWAY FOR THE CONVERSION OF A MUNICIPAL WATER TREATMENT PLANT TO A LIQUID INDUSTRIAL WASTE TREATMENT FACILITY,
For primary bibliographic entry see Field 6B.
W81-04610

MEDIA MUDDIES RESERVOIR WATER STORY,
Water and Pollution Control, Vol 118, No 2, p 22, 30, February, 1980. 1 Fig.

Descriptors: *Drinking water, *Phenols, Taste, Odor, Water quality, *Reservoirs, Conduits, Epoxy resins, Industrial wastes, South Peel water system, Ontario, Maintenance.

Problems encountered at one of the South Peel Water System reservoirs are discussed. Due to the location of the pressure release valve and reservoir level control valve and the mode of operation adopted to promote circulation through both cells of the reservoir, an incident occurred which caused the 50 psi pressure to be directed to the supply conduit below the floor slab of a cell. The conduit failed in several areas and about 1800 feet of cracks occurred in both the supply and inlet conduits located below the floor slab. About two weeks after repairs were completed, complaints were received that the water was medicinal and antiseptic in taste and odor. All beverages containing acids such as tea, coffee, and oange juice were virtually undrinkable. At the same time a new water purification plant had been placed into service and was now supplying the same reservoir with water. A refinery, located one mile west of the new plant, was noted in the news media as a major contributor to phenolic contamination of Lake Ontario in that area. Tests indicated that p-chlorophenol and 2,4-dichlorophenol were causing the taste and odor problems. However, the cause of the contamination was not the refinery in this case, but was a minor change made to the epoxy compound in two places during the repair of the cracks. The altered epoxy resin, when exposed to water at the surface of the conduit, released phenols into the surrounding water. (Baker-FRC)
W81-04613

AQUARIUM PLANTS COULD BE CHEAP MAGNETS TO TRAP ASBESTOS,
D. Dempster.
Water and Pollution Control, Vol 118, No 6, p 31, June, 1980.

Descriptors: *Asbestos, *Water treatment, Filtration, Plants, Elodea, Water pollution control.

An ordinary aquarium plant, Elodea, was able to remove more than 46% of the fibers from asbestos-laden water in an experimental setup. A few Elodea plants were placed in aquariums filled with water containing 150 million asbestos fibers per liter, a heavy concentration. In four weeks of the 10 wk trial, nearly half the fibers were gone. Photomicrographs showed the fibers clinging in clumps to the plants. (Baker-FRC)
W81-04614

AWT--BLACK BOX OR PANDORA'S BOX,
For primary bibliographic entry see Field 6E.
W81-04618

O'HARE PLANT DESIGNED FOR COMMUNITY ACCEPTANCE,
PRC Consoer Townsend, Inc., Chicago, IL.
W. J. Beckman, and F. O. Gilbertsen.
Water/Engineering and Management, Vol 128, No 4, p 52-54, April, 1981. 2 Fig.

Descriptors: *Waste water treatment, *Waste water facilities, Water treatment facilities, Chicago, Advanced waste water treatment, Chlorination, Sludge thickening, Sludge digestion, Aesthetics, *Des Plaines, Illinois.

The O'Hare Water Reclamation Plant in Des Plaines, Illinois is described. The plant area was landscaped with great care to make it appealing and acceptable to the community as well as serviceable. A computer-controlled irrigation system was installed to supply sufficient moisture for the extensive vegetation. Plant effluent is used in the irrigation system, thus eliminating the need for using potable water. The new 72 mgd activated-sludge waste water treatment facility is connected to the upper Des Plaines tunnel system, which is part of the Tunnel and Reservoir Plan of the Metropolitan Sanitary District of Greater Chicago. Here temporary storage of sewage occurs during heavy rainfall. Flow of waste water into the treatment plant is controlled by high pressure gates. Waste water is pumped to the treatment plant from the tunnel 180 ft below ground. Influent waste water is carried by a concrete conduit from the subterranean gate-chamber to the screen chamber in the first shaft. Two other shafts are pump wells

equipped with three 48 mgd pumps each. Magnetic coupling-type, variable-speed motor drives run the pumps, which are placed by an air-bubbler system. Aeration facilities were designed as two separate batteries of aeration and settling tanks. Secondary effluent receives tertiary treatment in dual-media gravity filters. Chlorine disinfection is accomplished by mechanical mixing of sodium hypochlorite with plant effluent. Sludge is transferred to another treatment plant for thickening and digesting. (Baker-FRC)
W81-04622

FOAM CONTROL IN AERATION TANKS,
Koach Engineering, Pacoima, CA.
E. D. Nelson.
Water/Engineering and Management, Vol 128, No 4, p 63, 64, April, 1981. 1 Tab.

Descriptors: *Foam separation, *Aeration, Water treatment facilities, *Waste water treatment, Industrial wastes, Industrial effluents.

Design factors in the construction of a foam breaking system are discussed. The problem foams were heavy foams that were not effectively handled by spraying water and continued to rise over walkways and ran into the galleries of waste water treatment plants. Two design objectives became clear. First, the foam-breaking system should be based on mechanically shearing or bursting the bubbles, as that requires the least amount of energy. Second, foam destruction should be accomplished within the tank, and the solids passed on to the final settling tank rather than removing them. This would greatly decrease the capital cost and energy requirements. It was proposed that the bubbles in the foam be broken near the downstream end of the aeration tanks, and that liquified foam be allowed to flow into the final sedimentation tanks while still in suspension. The foam breaker was to have the ability to be self-feeding so that additional energy would not be needed for that purpose. The first prototype tests indicated that the shearing of the foam was adequately accomplished with light semirigid materials instead of metal pins. The production model was tested at the San Jose Creek Plant in Los Angeles. (Baker-FRC)
W81-04623

AERATION PLANTS IMPROVE COUNTRY SEWAGE TREATMENT,
Water and Pollution Control, Vol 118, No 3, p 56, 68, March, 1980.

Descriptors: *Waste water treatment, *Lagoons, Aerated lagoons, Waste water lgoons, Ponds, Water pollution control, Kings County, Nova Scotia.

The treatment of waste water from neighboring groups of communities has been successfully begun in Kings County, Nova Scotia, in an attempt to solve its pollution control problem. Two more sysems are under construction, replacing half of the two mechanical plants and two oxidation ditches still in use. If one includes parts and labor for mechanical plants, the Air-Aqua Systems operate for a total cost of only one-half to one-third as much as mechanical plants. With many mechanical plants the chances for error and the resulting complications after an error in treatment is made are time consuming and costly. The operation of a lagoon system is significantly simpler. There is also no sludge to dispose or remove. Wildlife seem to find the aerated lagoon systems attractive and not harmful. (Baker-FRC)
W81-04624

POLLUTION SOLUTIONS IN THE BREWING INDUSTRY,
Wimpey Unox Ltd. (England).
Effluent and Water Treatment Journal, Vol 21, No 1, p 42-43, January, 1981. 2 Tab.

Descriptors: *Waste water treatment, *Food-processing wastes, *Industrial waste water, Brewery wastes, Waste water facilities, Project planning, Planning, Municipal waste water, Filtration, Great Britain, Tadcaster.

The sewage treatment plant at Tadcaster, Great Britain, consists of two facilities. The old treatment works were commissioned in 1906 for the treatment of combined domestic wages and brewery wastes from three local breweries. These old works consist of inadequate sedimentation tanks which are unable to produce an effluent of a standard required by current water quality objectives. The tanks provide rudimentary sedimentation for 85% of the wastes produced by the breweries. The new works were constructed in 1963, to treat domestic sewage. Wastes handled by the facility are now comprised of about 65% domestic sewage and 35% brewery waste, handling the 15% of these latter wastes not treated by the old works. A new treatment plant is currently being constructed. This plant was planned by a group consisting of the three breweries, consulting engineers, and the Yorkshire Water Authority. The plant will be built on land owned by the Authority and will be operated by the Authority, but the capital and operating costs will be paid by the breweries. The Wimpey Unox process will be utilized for the biological treatment of brewery wastes in admixture with domestic sewage. (Carroll-FRC)
W81-04637

PARTICLE SIZE DISTRIBUTION IN SECONDARY EFFLUENTS,
Stuttgart Univ. (Germany, F.R.).
M. Roth.
Effluent and Water Treatment Journal, Vol 21, No 1, p 19, 21-25, January, 1981. 6 Fig, 13 Ref.

Descriptors: *Particle size, *Effluents, *Secondary waste water treatment, Tertiary waste water treatment, Distribution patterns, Suspended solids, Filtration, Measurement techniques.

Microstrainers and rapid sand filters used for tertiary waste water treatment can only operate successfully if the residual contamination in the secondary effluent is present in the form of easily filterable floc particles. The filtration properties of the suspended material in the influent are determined largely by the size and size distribution of the particles, their shape and structure, and their shear resistance or compressibility. The suspended matter in secondary effluents is mainly composed of a large number of species of microorganisms in their different forms of aggregation, characterized by low specific density, low compressibility, and high transmittance of light. An accurate counting and sizing of these particles is only possible using microscopic methods. The size distributions (particle-number and particle-area distribution) can mostly be approximated by log-normal distributions, characterized by median and standard deviation. There are no fundamental differences as to the size distributions in the effluents of activated sludge plants and trickling or rotating-disc filters. The particles' projection area distribution is thought to be the most suitable form for representing the particle sizes in secondary effluents. The cumulative frequency of the particles' projection area is also a proper means for roughly estimating the weight fraction of particles below or above a definite diameter. The mean particle size decreases distinctly with increasing biological oxygen demand loading of the activated sludge plant and the trickling filter. (Carroll-FRC)
W81-04640

ENERGY CRISIS REDIRECTS SLUDGE DISPOSAL PERSPECTIVES,
Canada Centre for Inland Waters, Burlington (Ontario).
N. W. Schmidtke.
Water and Pollution Control, Vol 118, No 4, p 16-19, April, 1980. 5 Fig, 3 Tab.

Descriptors: *Sludge, *Waste disposal, Sludge dewatering, *Land disposal, Toxicity, Waste treatment facilities, Energy, Phosphorus, Potassium, Ontario.

Sludge production is influenced by a number of variables. The type of process used in the conversion of substrate greatly affects the amount of biomass produced. The amount of sludge produced also varies with the nature of the substrate oxidized. Higher volumes are obtained in winter than in summer. The total solids concentrations of the raw primary sludges may vary from 3.5 to 8%. As effluent objectives become more stringent, treatment processes grow more complex, and sludge quantities increase as well. Sludge production data from 42 secondary plants using the conventional activated sludge process were analyzed. Sludge production data were also examined for 15 secondary biological plants, upgraded to include phosphorus removal. A variety of management strategies ranging from sludge treatment/disposal to utilization are available and in use currently. Management strategies must be tailored to meet local, regional and national needs and be acceptable in terms of cost, the environment, public health and the public interest. Two basic components associated with sludge utilization are the optimization of the anaerobic digestion process to generate gas which can be used as an energy source, and the modulation of sludge characteristics. (Baker-FRC)
W81-04645

WET PROGRAM CONVERTS OIL RESIDUE.
Water and Pollution Control, Vol 118, No 6, p 26, June, 1980. 1 Fig.

Descriptors: *Industrial waste water, *Waste water treatment, Oil industry, Oil refineries, Industrial plants, Oily water, *Oil pollution, Oil wastes, Separation techniques.

A new water effluent treatment (WET) system constructed at Dartmouth, N.S. is described. The system is a major part of a 85,000 barrel/day refinery. One of the central components is the $13 million biological oxidation plant which converts oil residue in process and runoff water to carbon dioxide and water. The process is similar to that used at a sewage treatment plant. Water to be treated arrives from four sources: ballast pumped ashore from ships' tanks, from rainwater and oil processes run-off and from saltwater cooling systems. The process includes skimming the floating oil from the surface of the water, filtering it to remove lesser amounts of oil, and biological oxidation for removal of oil and chemical residue. Clean water is directed to Halifax Harbor. (Baker-FRC)
W81-04646

APPLYING DAIRY EFFLUENT ON CROPLAND,
Southern Illinois Univ. at Carbondale.
R. K. Jump, F. J. Olsen, J. H. Jones, G. C. McCoy, and J. J. Patterson.
BioCycle, Vol 22, No 1, p 51-55, January/February, 1981. 5 Tab, 14 Ref.

Descriptors: *Dariy wastes, *Waste water farming, *Fescues, Biological treatment, Crop production, Forage grasses, Potassium, Sodium, Nitrates, Waste water treatment, Land disposal, Water reuse.

The effects of liquid dairy wastes application on tall fescue were investigated. Crop yields, forage acceptability and nutrient uptake were investigated. Wastes were treated biologically in a settling basin and holding tank, and pumped at a rate of 1500 liters/day during winter and spring and 1900 liters/day during summer and fall. Tall fescue was sampled biweekly for chemical analysis during the growing season, and tested for P, Ca, Mg, K, and Na. The effluent was high in K and Na because of a detergent used in the dairy. Effluent additions raised the soil pH slightly and increased P and the bases. The nitrate values in the fescue were faily high but never approached toxic levels. The high amount of K was attributed to luxury consumption. Infestation by annual grassy weeds raised some questions as to the desirability of using tall fescue as the vegetative cover with continuous effluent application. Other perennial grasses may be more tolerant of wet soil conditions. (Small-FRC)
W81-04647

OPERATING A SOLAR AQUACULTURE *SEWAGE TREATMENT PLANT,*
Cal Recovery Systems, Inc., Richmond, CA.

C. G. Golueke, and L. F. Diaz.
BioCycle, Vol 22, No 1, p 38-39, January/February, 1981.

Descriptors: *Aquaculture, *Water hyacinth, *Solar energy, Aerated lagoons, Sand filters, Ozonation, Performance evaluation, Waste water facilities, *Waste water treatment.

In Hercules, California, 100,000 to 200,000 gallons of sewage per day is treated by a solar aquaculture facility. This facility makes full use of the water hyacinth as a biological agent involved in the stabilization of the dissolved and suspended solids. The plant occupies about 1.2 acres of land, cost 2.2 million dollars, and has been in operation for about five months. It includes a treatment tank, an aeration basin, and a higher plant (water hyacinth) lagoon. All three units are covered by a greenhouse-type structure. The primary tank removes grit and grease, and its sludge is removed every four to six months and transported to a landfill. The aeration basin provides an extensive surface for the attachment of microflora and microfauna and treats the effluent for about 14 hours. After treatment in the plant growth lagoon for about 6.2 days, the effluent is discharged through a sand filter, treated by ozonation, and pumped to a nearby treatment plant. The water cannot be directly discharged because the plant is still in the testing stages. There have been some problems. The ozonation equipment has been inadequate, the plastic sheeting covering the facility has already been replaced, and harvesting the water hyacinths has not been as easy as expected. The plan is to eventually compost the hyacinths. (Small-FRC)
W81-04648

LAND TREATMENT OF WASTEWATER,
N. Goldstein.
BioCycle, Vol 22, No 1, p 34-37, January/February, 1981.

Descriptors: *Spray irrigation, *Crop production, *Municipal waste water, *Land disposal, Pine trees, Corn, Industrial wastes, Costs, Waste water treatment, Waste water farming, Water reuse, Impaired water use.

Spray irrigation with crop or forest production is the method of waste water treatment practiced in Muskegon County, Michigan; El Reno, Oklahoma; and Clayton County, Georgia. Muskegon County, Michigan, began a program of spray irrigation and crop production on sandy, unproductive soil in 1974. This system handles 28 million gallons per day, and 60% of the waste water is of industrial origin. In 1975, the total cost for treatment was 24 cents/1000 gallons and in 1980, 20.6 cents/1000 gallons. Corn has been the main agricultural crop. In El Reno, Oklahoma, the treatment operation is similar to the one in Michigan, except that the waste water is used to irrigate private land in return for rights to the groundwater on that property. The El Reno facility has a flow of 2.5 million gallons per day. The Clayton County, Georgia, treatment facility is under construction. It will spray irrigate 2400 acres of pine trees of pulp production. The land treatment system is expected to produce cleaner water than an advanced waste water treatment facility and allows for additional residential and industrial growth in the area. (Small-FRC)
W81-04649

CENTRALIZED TREATMENT AND DISPOSAL OF SPECIAL WASTES IN THE FEDERAL REPUBLIC OF GERMANY,
Department of Sewage Treatment, Essen (Germany, F.R.).
N. Roesler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-191900, Price codes: A08 in paper copy, A01 in microfiche. In: Third Conference on Advanced Pollution Control for the Metal Finishing Industry, Kissimmee, Florida, April 14-16, 1980. Environmental Protection Agency Report EPA-600/2-81-028, February, 1981. p 104-114, 13 Fig, 4 Tab.

Descriptors: *Industrial wastewater, *Metal-finishing wastes, *Wastewater treatment, *Sludge disposal, Sludge drying, Dewatering, Wastewater facilities, Landfills, Government supports, Economic aspects.

Although the legal task of the public wastewater treatment plants in the Federal Republic of Germany is the acceptance and treatment of normal municipal wastewater, they often had to treat unusual waste components, which, despite regulations, entered into the sewers and complicated treatment. Since about 1960, intensive efforts have been made in Germany which have resulted in centralized treatment plants with facilities for treating the wastes from different industries. An example of facilities based on private and voluntary activities is the Ruhrverband. The central decontaminating plant, in Iserlohn, treats metal finishing wastes from an area of 380 sq km. In this area there are about 200 installations running approximately 1000 baths for galvanizing, anodizing, and non-ferrous metal pickling. The central plant can handle toxic concentrations, thin and thickened sludges, and dewatered sludges requiring disposal. A storage, dewatering and dumping facility for sludges from Heiligenhaus has been operating since 1968. The centralized treatment and disposal of special wastes in Bavaria is carried out by a company jointly owned by public authorities and firms from the chemical, metal processing, paper, and oil industries. The fact that the company does not have to make a profit on waste disposal and that the supervisory board has to approve the disposal charges means that conditions exist which enable concerns to deliver their wastes and have them properly disposed of in accordance with the law, without the need for coercion. (Moore-SRC)
W81-04698

5E. Ultimate Disposal Of Wastes

LAND APPLICATION OF DOMESTIC WASTE WATER IN FLORIDA--STATEWIDE ASSESSMENT OF IMPACT ON GROUNDWATER QUALITY,
Geological Survey, Tallahassee, FL. Water Resources Div.
B. J. Franks.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-202350, Price codes: A03 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 81-3, 1981. 37 p, 4 Fig, 6 Tab, 25 Ref.

Descriptors: Wastewater disposal, *Municipal wastes, *Wastewater treatment, Legislation, Groundwater recharge, Water quality, Water pollution effects, Water reuse, Irrigation, Monitoring, Observation wells, Geohydrology, Chemical analysis, *Florida.

In Florida domestic waste water is being applied to the land for disposal and reuse. State and Federal regulations favor land-application methods over other advanced waste water treatment practices. Despite the increasing use of this alternative technology, little is known about localized effects on groundwater quality. This report documents the extent of land-application practices in Florida and summarizes case study information on some of the more adequately monitored site throughout the State. More than 2,500 sites in Florida are permitted by the Department of Environmental Regulation for applying domestic waste water to the land. The majority (more than 1,700 sites), classified as infiltration ponds, are concentrated in central and southern Florida. More than 560 sites classified as drainfields, and more than 250 sites classified as irrigation sites, are located primarily in central Florida. An estimated 150 million gallons per day of domestic waste water, after required secondary treatment, are applied to Florida soils. Despite the large numbers of sites and the considerable volume of waste water utilized, little is known about potential impact on groundwater quality. At the few sites where observation wells have been drilled and local groundwater quality monitored, no significant deterioration of water quality has been detected. (USGS)
W81-04327

BASE OF FRESH GROUNDWATER, NORTHERN LOUISIANA SALT-DOME BASIN AND VICINITY, NORTHERN LOUISIANA AND SOUTHERN ARKANSAS,
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W81-04348

A PRELIMINARY REPORT OF THE GEOHYDROLOGY OF THE MISSISSIPPI SALT-DOME BASIN,
Geological Survey, Jackson, MS. Water Resources Div.
C. A. Spiers, and L. A. Gandl.
Available from the OFSS, USGS, Box 25425, Denver Fed. Ctr., Denver, CO 80225, paper copy $7.50, microfiche $8.00. Geological Survey Open-File Report 80-595, 1980. 45 p, 23 Fig, 2 Tab, 70 Ref.

Descriptors: *Geohydrology, *Radioactive wastes, *Radioactive waste disposal, Groundwater, Groundwater movement, Path of pollutants, Geohydrologic units, Aquifer characteristics, Water quality, Chemical analysis, Evaluation, *Mississippi, *Mississippi salt dome basin, Salt domes.

The U.S. Department of Energy is investigating the suitability of salt domes in the Mississippi salt-dome basin as repositories for storing radioactive wastes. The Department of Energy has requested that the U.S. Geological Survey describe the groundwater hydrology of the Mississippi salt-dome basin, giving special attention to direction and rate of movement of water. In this first part of a continuing investigation the data obtained from one year of extensive literature search and data compilation are summarized. The regional groundwater hydrology in the salt-dome basin is defined with respect to (1) groundwater flow, (2) facies changes, (3) geological structure, (4) recharge and discharge, (5) freshwater-saltwater relations, and (6) identification of localities where additional data are needed. From the 50 piercement-type salt domes in the Mississippi salt-dome basin three domes (Richton, Cypress Creek, and Lampton) were selected for more intensive study. To further evaluate the geohydrology of Richton, Lampton, and Cypress Creek domes as possible sites for storage of radioactive waste, an intensive geohydrologic study based on a comprehensive test drilling program near the domes is planned. (USGS)
W81-04353

WASTE ACTIVATED SLUDGE PROCESSING,
Los Angeles County Sanitation Districts, Whittier, CA.
S. R. Austin, J. R. Livingston, and L. Tortorici.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-119331, Price codes: A12 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-80-147, August, 1980. 254 p, 95 Fig, 57 Tab, 17 Ref, 2 Append.

Descriptors: *Sludge disposal, *Sludge drying, *Sludge thickening, *Sludge digestion, *Composting, *Activated sludge, Dewatering, Biodegradation, Filtration, Centrifugation, Flotation.

In order to determine the most effective means of handling waste activated sludge from the future secondary treatment facilities at the Joint Water Pollution Control Plant in Carson, California, various methods of thickening, stabilization, conditioning, dewatering, and drying have been evaluated. Dissolved air flotation effectively thickened waste oxygen activated sludge to 3.5% total solids at polymer dosages below 4 lb/ton. Basket and scroll type centrifuges achieved higher thickened sludge solids, but the necessary polymer dosages were higher and the thickened sludge was too viscous to allow mixing during subsequent processes. Mesophilic anaerobic digestion appears to be the most attractive stabilization process. Vacuum and pressure filtration required extremely high lime and ferric chlorine dosages, and polymer conditioning was ineffective for filtration. Scroll centrifugation of anaerobically digested waste activated sludge produced 15% cakes at a 15 lb/ton

polymer dosage. Basket centrifugation achieved comparable results, but the run times were extremely short. Combining the digested waste activated sludge with digested primary sludge before dewatering may reduce the chemical costs and will result in more manageable cakes. Thermal conditioning of waste activated sludge greatly improved its dewatering characteristics. Successful composting of the dewatered digested waste oxygen activated sludge required the recycling of large volumes of dried compost product to adjust the initial moisture content of the cakes. One of the two most cost effective sludge disposal systems incorporated dissolved air flotation, mesophilic anaerobic digestion, centrifuge dewatering, compost drying, and sale to a fertilizer manufacturer. The other was dissolved air flotation thickening, thermal treatment, filtration dewatering, and landfill disposal. (Moore-SRC)
W81-04376

MUNICIPAL SOLID WASTE DISPOSAL IN ESTUARIES AND COASTAL MARSHLANDS,
Municipal Environmental Research Lab., Cincinnati, OH.
For primary bibliographic entry see Field 5C.
W81-04384

COST COMPARISONS OF TREATMENT AND DISPOSAL ALTERNATIVES FOR HAZARDOUS MATERIALS; VOLUMES I AND II,
SCS Engineers, Redmond, WA.
For primary bibliographic entry see Field 5D.
W81-04385

CONCENTRATION TECHNOLOGIES FOR HAZARDOUS AQUEOUS WASTE TREATMENT,
Touhill, Shuckrow and Associates, Inc., Pittsburgh, PA.
For primary bibliographic entry see Field 5D.
W81-04397

LONG-TERM CHANGES IN BENTHIC FAUNA RESULTING FROM SEWAGE SLUDGE DUMPING INTO THE NORTH SEA,
Hamburg Univ., (Germany, F.R.). Inst. fuer Hydrobiologie und Fischereiwissenschaft.
For primary bibliographic entry see Field 5C.
W81-04415

INVESTIGATIONS INTO SEWAGE GREASE BEHAVIOR IN COASTAL WATERS,
Australian Atomic Energy Commission.
For primary bibliographic entry see Field 5B.
W81-04418

SANITARY LANDFILLS,
For primary bibliographic entry see Field 5B.
W81-04441

SLUDGE DISINFECTION BY IRRADIATION.
Public Works, Vol 112, No 3, p 128, 130, 131, March, 1981. 1 Fig.

Descriptors: *Irradiation, Disinfection, *Sludge, Pathogenic bacteria, *Sludge treatment, Sludge drying, Viruses, *Waste water treatment.

Five to ten sludge irradiators are being developed at selected waste water treatment centers, with the support of the Department of Energy. Four communities have been involved in feasibility studies, and more communities have expressed interest in the program. An 8-ton/day pilot plant has been operated in New Mexico which routinely irradiates air-dried sludges for agricultural and biological studies at New Mexico State University. Also, Sandia National Laboratories has been investigating the types of bacteria, viruses, parasites, and fungi found in sludge and the effects of irradiation on them. A dose of one megarad is specified by the EPA for sewage solids. This has been demonstrated to kill bacteria. Air drying or anerobic digestion plus treatment with 0.5 megarad is sufficient to inactivate most viruses present, although irradiation alone is not effective against viruses. The pilot plant uses low-energy radiation from cesium-137, a waste product of defense reactor operations, to disinfect sludge. The preliminary estimate for the design and construction of a 25 ton/day facility, exclusive of the source cost, is $1,475,000. (Small-FRC)
W81-04454

THE UTILITY OF EXTRACTION PROCEDURES AND TOXICITY TESTING WITH SOLID WASTES,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5C.
W81-04488

DISPOSAL AND REMOVAL OF HALOGENATED HYDROCARBONS IN SOILS,
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 5B.
W81-04490

PREDICTING PERCOLATION THROUGH WASTE COVER BY WATER BALANCE,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Geotechnical Lab.
For primary bibliographic entry see Field 5G.
W81-04493

INTERACTION OF SELECTED LINING MATERIALS WITH VARIOUS HAZARDOUS WASTES - II,
Matrecon, Inc., Oakland, CA.
For primary bibliographic entry see Field 8G.
W81-04496

ASSESSMENT OF PROCESSES TO STABILIZE ARSENIC-LADEN WASTES,
JBF Scientific Corp., Wilmington, MA.
J. C. Johnson, and R. L. Lancione.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-175086, Price codes: A13 in paper copy, A01 in microfiche. In: Disposal of Hazardous Waste; Proceedings of the Sixth Annual Research Symposium, March 17-20, 1980, Chicago, Illinois. Environmental Protection Agency Report EPA-600/9-80-010, March, 1980. p 181-186, 1 Fig, 1 Tab, 10 Ref.

Descriptors: *Industrial wastes, *Arsenic, *Waste management, *Leaching, Waste disposal, Cost analysis, Solid wastes, Stability, Regulations, Water pollution prevention.

Industrial solid waste containing arsenic was treated with many proprietary and generic fixation processes to evaluate the processes' ability to retard the leaching of arsenic. This evaluation was achieved by performing two types of laboratory leaching tests, a long-term shake test and a modified extraction procedure. Several processes were found to reduce arsenic leaching rates by at least four orders of magnitude. A concluding discussion shows that fixation can be economically competitive with other legal methods of hazardous waste disposal. Several barriers to implementation are identified. They are: delays in official promulgation of hazardous waste regulations; uncertainty about the long-term stability of fixed products; and uncertainty about future definitions of 'hazardous'. (Brambley-SRC)
W81-04497

FIELD INVESTIGATION OF CONTAMINANT LOSS FROM CHEMICALLY STABILIZED SLUDGES,
Army Engineer Waterways Experiment Station, Vicksburg, MA.
For primary bibliographic entry see Field 5B.
W81-04498

LEACHATE FROM MUNICIPAL AND INDUSTRIAL WASTE LANDFILL SIMULATORS,
Cincinnati Univ., OH.
For primary bibliographic entry see Field 5B.
W81-04499

CHEMICALLY STABILIZED INDUSTRIAL WASTES IN A SANITARY LANDFILL ENVIRONMENT,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5B.
W81-04500

SOLIDS REMOVAL AND CONCENTRATION,
Industrial Filter and Pump Mfg. Co., Cicero, IL.
R. W. Crain.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-191900, Price codes: A08 in paper copy, A01 in microfiche. In: Third Conference on Advanced Pollution Control for the Metal Finishing Industry, Kissimmee, FL. April 14-16, 1980. EPA Report EPA-600/2-81-028, February, 1981. p 56-62, 16 Fig 3 Tab, 13 Ref.

Descriptors: *Metal-finishing wastes, *Sludge drying, *Sludge thickening, *Sludge disposal, Sludge lagoons, Clarifiers, Dewatering, Centrifugation, Filters, Incineration.

The metallic hydroxides and other sludges resulting from the treatment of metal finishing wastes must be made presentable to the receiving authority or a private disposal site. Properly neutralized and conditioned, thickened or dewatered sludge has been shown to be relatively inert. The current state of the art of concentrating sludges to enable them to be handled and transported as inexpensively as possible and disposed of at approved sites is examined. Numerous processes and equipment types are available for sludge thickening and dewatering. Criteria for selecting techniques depend on the characteristics and the amount of sludge to be processed, funds available, size and type of treatment plant, regulatory requirements, and final disposition. Methods or devices used for thickening and dewatering include the following: lagooning, clarifiers, centrifuges, vacuum filters, belt filters, filter presses, pressure leaf precoated filters, fixants and incineration. Lagooning as a method is no longer widely accepted, although many lagoons still exist. Clarifiers are divided into four categories: gravity, stirred gravity, dissolved air flotation, and rapid settlers. Centrifuges can typically dewater to 15%, but the centrate almost always must be recycled. Pressure leaf precoated filters produce the best filtrate of any dewatering device, with 0-5 ppm suspended solids. (Moore-SRC)
W81-04507

RADIOCHEMICAL STUDIES OF THE LEACHING OF METAL IONS FROM SLUDGE BEARING CONCRETE,
Manhattan Coll., Bronx, NY. Dept. of Chemistry.
J. D. Mahoney, E. A. Dwyer, W. P. Saukin, and R. J. Spinna.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-191900, Price codes: A08 in paper copy, A01 in microfiche. In: Third Conference on Advanced Pollution Control for the Metal Finishing Industry, Kissimmee, Florida, April 14-16, 1980. Environmental Protection Agency Report EPA-600/2-81-028, February, 1981. p 65-69, 6 Fig, 4 Tab, 4 Ref.

Descriptors: *Sludge disposal, *Leaching, *Concretes, *Metal-finishing wastes, *Metals, Heavy metals, Radioactive tracers, Aluminum, Cadmium, Chromium, Cobalt, Manganese, Nickel, Zinc, Calcium.

The possibility of incorporating electroplating sludge into concrete as an alternative disposal procedure is being investigated. The hardening of concrete can be seen as the process of making artificial minerals. The extent to which metal ions have been mineralized in concrete, made with electroplating sludge as part of the mixing water, can be determined by analysis of leach water. Radiochemical techniques were employed because they provide a fast, accurate, and extremely sensitive method of identifying the metal and its concentration in the leach water. The metals studied include: aluminum, cadmium, chromium, cobalt, manganese, nickel, zinc manganese, and calcium. The results with respect to the rate of which aluminum

is leached from the concrete are inconclusive. The extent to which the metals studied leach into the immersion water is generally of a very low level. Calcium is generally not a constituent of electroplating sludge but it does make up about 45% of Portland cements. A significant amount of calcium enters the leach water, about 1% of the total calcium content of cement. A puzzling aspect of the sludge-metal leaching system is the apparent reabsorption of certain metals with extended exposure of the concrete to the same leach water. (Moore-SRC)
W81-04508

HAZARDOUS WASTE MANAGEMENT FACILITIES: THE SITING PROBLEM AND POSSIBLE SOLUTIONS,
Liqwacon Corp., Blue Bell, PA.
F. Boni.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-191900, Price codes: A08 in paper copy, A01 in microfiche. In: Third Conference on Advanced Pollution Control for the Metal Finishing Industry, Kissimmee, Florida, April 14-16, 1980. Environmental Protection Agency Report EPA-600/2-81-028, February, 1981. p 132-134, 11 Ref.

Descriptors: *Metal-finishing wastes, *Industrial waste waters, *Sludge disposal, *Waste disposal, *Site selection, Regulations, Social aspects, Hazardous materials.

Regulations and societal pressures are reducing the available disposal options for the surface finishing industry. There is need for involvement at the state level in the siting aspect of the growing problem facing the surface finishing industry of finding safe, legal locations for disposal of residues from waste treatment. Methods available for the disposal of sludges include landfills, reclamation, chemical fixation, and heat treatment, but landfill disposal is still the most common practice in the plating industry. State involvement is more likely to be successful if siting procedures include public participation in resolution of social and economic issues. Education of the public is a necessary precondition for productive participation in the siting process. The surface finishing industry and its professional and trade organizations have a role in increasing public awareness of the problems and potential solutions. The current popular view is that public opposition to new disposal facilities is growing and future sites may have to be located on Federal and State lands. However, there are recent instances of approved applications for sites owned by the private sector. (Moore-SRC)
W81-04511

SMALL WATER SYSTEMS: WHAT CAN GOVERNMENT DO FOR THEM,
Environmental Protection Agency, Washington, DC. State Programs Div.
For primary bibliographic entry see Field 6E.
W81-04627

REGULATION OF ENVIRONMENTAL POLLUTANTS: INTRODUCTORY REMARKS,
Health Effects Research Lab., Research Triangle Park, NC.
For primary bibliographic entry see Field 5C.
W81-04635

ENERGY CRISIS REDIRECTS SLUDGE DISPOSAL PERSPECTIVES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5D.
W81-04645

CENTRALIZED TREATMENT AND DISPOSAL OF SPECIAL WASTES IN THE FEDERAL REPUBLIC OF GERMANY,
Department of Sewage Treatment, Essen (Germany, F.R.).
For primary bibliographic entry see Field 5D.
W81-04698

5F. Water Treatment and Quality Alteration

REMOVING POTENTIAL ORGANIC CARCINOGENS AND PRECURSORS FROM DRINKING WATER; VOLUME I AND APPENDIX A,
Florida International Univ., Miami. Drinking Water Quality Research Center.
P. R. Wood, D. F. Jackson, J. A. Gervers, D. H. Waddell, and L. Kaplan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-107146, Price codes: A17 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-80-130a, August, 1980. 389 p, 179 Fig, 53 Tab, 20 Ref, Append.

Descriptors: *Water treatment, *Carcinogens, *Adsorbents, *Drinking water, *Halogenated organic compounds, *Bacteria, Organic compounds, Trihalomethanes, Adsorption, Activated carbon, Resins.

Feasible and economical methodologies were needed to remove existing organic contaminants, specifically chloroform, bromodichloromethane, chlorodibromomethane, and bromoform, from and prevent development of potential carcinogens in the public water supply in Dade County, Florida. A four-phase study was designed to evaluate the efficiency of three adsorbents in removing 19 individual halogenated organics and trihalomethane precursors. These adsorbents were: XE-340, a carbonized polymeric macroeticular resin; IRS-904, a strong base cationic resin designed to remove large moleular weight substances, such as precursors from water; and granular activated carbon ((GAC). Adsorbent columns were placed at various stages in the water processing system: the raw-water stage, the lime-softened water at the upflow Hydrotreator effluent, and the finished water stage. Four 0.76 m deep GAC Filtrasorb 400 columns, arranged in series on the finished waterline, were most effective in reducing the level of the trihalomethanes present in the finished water. The Polanyi-Manes Theory of adsorption was applied and found helpful in interpreting results. Preliminary studies were made of the bacterial profile of the Preston Water Treatment plant, raw and finished water, and effluent from four GAC columns. Raw water organisms colonized the initially bacteria-free GAC columns and released vast numbers of bacteria into the water flowing through the columns. (Moore-SRC)
W81-04381

SELENIUM REMOVAL FROM GROUNDWATER USING ACTIVATED ALUMINA,
Montgomery (James M.), Inc., Pasadena, CA.
R. R. Trussell, A. Trussell, and P. Kreft.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-111023, Price codes: A08 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-80-153, August, 1980. 159 p, 46 Fig, 19 Tab, 29 Ref, Append.

Descriptors: *Drinking water, *Selenium, *Water treatment, *Activated alumina, Absorbents, Cost analysis, Fluorometry, Trace elements, Atomic absorption spectroscopy, Groundwater pollution, Selenium removal.

Selenium is a contaminant found in trace quantities in some groundwaters and surface waters in the United States. The National Drinking Water Regulations limit total selenium to .01mg/l. Laboratory studies were performed to determine optimum conditions for using activated alumina to remove selenium from drinking water supplies. Column tests showed that the capacity of alumina for Se IV decreased as influent pH increased. Best removal of Se IV occurred at pH 5 where 1200 bed volumes of water with influent concentration of 0.2 mg/l were treated before breakthrough occurred. Optimum regenerant was 1.5 lbs/cu ft of 0.5% NaOH at 1/2 gpm/sq ft upflow and 0.7 lb/cu ft of 0.25% sulfuric acid at 1 gpm/sq ft downflow. The capacity of alumina for Se VI decreased as either pH or sulfate concentration increased. Removal costs would be three to four times higher if Se VI is the predominant form of selenium present in the water supply. The fluorometric technique can be used to determine Se IV concentrations. Atomic Absorption Spectroscopy remains the best method for total selenium. (Moore-SRC)
W81-04392

CHLORINATION OF AQUATIC HUMIC SUBSTANCES,
North Carolina Univ. at Chapel Hill.
R. F. Christman, J. D. Johnson, D. L. Norwood, W. T. Liao, and J. R. Hass.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-161952, Price codes: A09 in paper copy, A01 in microfiche. Environmental Protection Agency Project Summary EPA-600/S2-81-016, March, 1981. 5 p, 1 Tab.

Descriptors: *Humic acids, *Chlorination, *Water treatment, *Fulvic acids, *Chloroform, Aromatic compounds, Hydrocarbons, Oxidation, Trihalomethanes, Drinking water, Surface water, Water pollution.

Aquatic humic material has been heavily implicated as an important reaction precursor of trihalomethanes in natural water systems exposed to chlorine. Experimental methods devised to isolate humic and fulvic acid fractions from natural surface waters involved classical precipitation of humic acids from large volumes of raw water, followed by concentration through settling and centrifugation. Fulvic acid materials were concentrated by adsorption on macroreticular XAD-2 resin followed by base elution. The controlled oxidation of these samples with solutions of potassium permanganate and aqueous chlorine was followed by solvent extraction, formation of methyl esters, and GC/MS analysis. Direct chlorination of both aquatic humic materials and model compounds shown to be major component parts of the aquatic humic and fulvic materials, produced chloroform. In addition to chloroform, a large number of chlorinated and nonchlorinated acid, phenols, and ketones were produced. Ring cleavage products such as saturated and unsaturated aliphatic mono- and dicarboxylic acids were major products of model as well as natural humic materials. Although hypochlorite is a significant degrader of the humic macromolecule, it is not as effective as alkaline potassium permanganate. The majority of the identified chlorine degradation products were nonchlorinated aliphatic acids. The aromatic acids are primarily polycarboxylic, suggesting carbon substitution on the aromatic rings at three or more sites in the undegraded molecule. No chlorinated aromatic compounds were identified. (Moore-SRC)
W81-04394

FIELD TEST OF CORROSION CONTROL TO PROTECT ASBESTOS-CEMENT PIPE,
Municipal Environmental Research Lab., Cincinnati, OH.
G. S. Logsdon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-152878, Price codes: A02 in paper copy, A01 in microfiche. Environmental Protection Agency Project Summary EPA-600/S2-81-023, March, 1981. 3 p.

Descriptors: *Asbestos cement, *Pipes, *Corrosion control, *Zinc, Water pollution control, Water conveyance, Potable water, Deterioration, Zinc orthophosphate, Asbestos fibers.

Asbestos-cement (A/C) pipe has been used by some water utilities as an alternative to cast iron when the treated water has had a history of corroding water mains. In some instances, using A/C pipe to carry aggressive or corrosive water has deteriorated the A/C pipe. To determine whether adding zinc orthophosphate to potable water would sufficiently coat an A/C pipe with zinc to prevent asbestos fibers from entering the water, storage tanks, and chemical and feed pumps were set up at each of the Greenwood, South Carolina, water treatment plants. Zinc orthophosphate was

fed into the system at an average rate of 0.3 mg/l. Two sections of new A/C pipe were installed to represent a low-flow and a high-flow water condition. Samples were periodically tested to determine the number of asbestos fibers in the water. The two pipe sections were removed and examined for the amount of zinc deposited on the surface. Although routine tests, such as pH and alkalinity, showed no significant changes during the study period, asbestos fibers in the water decreased substantially. Electron microscope photographs and energy dispersive X-ray spectra analyses showed coatings of zinc products on the two pipe samples. Thus adding zinc orthophosphate under the existing water quality conditions reduced or prevented corrosion of asbestos-cement pipe. (Moore-SRC)
W81-04395

APPLICATIONS OF THE BUBBLE FRACTIONATION TO WATER AND WASTE WATER TREATMENT,
Societe Lyonnaise des Eaux et de l'Eclairage (France).
For primary bibliographic entry see Field 5D.
W81-04403

REVERSE OSMOSIS WATER PURIFIER,
J. D. Kirschmann.
U.S. Patent No 4,218,317, 8 p, 8 Fig, 3 Ref; Oficial Gazette of the United States Patent Office, Vol 997, No 3, p 992, August 19, 1980.

Descriptors: *Patents, *Water treatment, Domestic water, Reverse osmosis, Water purification, Membrane processes, Equipment, Activated carbon.

A reverse osmosis water purifying device is provided with a flush water restrictor which serves to provide a suitable back pressure on the reverse osmosis membrane in order to affect the purification process. The device is designed for attachment to any source of pressurized water. The restrictor device consists of a capillary tube sized to provide a suitable ratio of flush water to purified water. A ball-type check valve surrounds the capillary tube at its point of exit and the ball valve may be dislodged in order to flush the membrane. The core of the membrane assembly is filled with activated charcoal in order to provide for a more efficient and complete purification. (Sinha-OEIS)
W81-04517

METHOD AND APPARATUS FOR TREATING WATER,
Fisons Ltd., London (England). (Assignee).
S. Jackson, and G. A. Roulstone.
U.S. Patent No 4,219,413, 9 p, 4 Fig, 5 Ref; Official Gazette of the United States Patent Office, Vol 997, No 4, p 1377, August 26, 1980.

Descriptors: *Patents, *Water treatment, *Water purification, Demineralization, Ion exchange, Resins, Separation techniques, Equipment, Regeneration.

A method and apparatus for treating water with a regeneratable material (e.g., and ion exchange resin) is described in which the regenerating reagents are fed to the material by pneumatic means. Preferably, the reagent is diluted in a small multi-fill dilution tank feeding the container(s) for the water treatment material. The quality of the deionised water is monitored before it leave the device. Conveniently, this is done by measuring the conductivity of the water using a conventional conductivity cell. In the regeneration cycle, the flow of water to be treated is shut off, acid is passed through the column(s), and alkali is passed through the column(s) to regenerate the resins. The effluent from the columns is preferably combined to provide a substantially neutral effleunt for discharge to waste and measures are provided to dilute the acid and alkali for use and safety interlocks are provided. (Sinha-OEIS)
W81-04523

WATER SYSTEM CONTROLLED BY LOAD MANAGEMENT PROGRAM, A CONSUMER-VOLUNTARY PROGRAM PAYS FOR THE SYSTEM IN ONE HOUR,
Water, Gas, and Light Commission, Albany, GA.
For primary bibliographic entry see Field 6B.
W81-04621

SELECTING AN O&M CONSULTANT FOR WASTE WATER TREATMENT FACILITIES,
York Waste Water Consultants, Inc., Stamford, CT.
D. J. Murphy, Jr., D. P. Johnson, and S. R. Kellogg.
Water/Engineering and Management, Vol 128, No 3, p 85-86, March, 1981.

Descriptors: *Maintenance, *Waste water facilities, *Contracts, Consultants, Plant operation, Training, Handbooks, Municipal waste water, Waste water treatment, *Waste water management.

The operation and maintenance of publicly owned treatment works is a national problem of great concern to public officials, regulatory agencies, and municipal owners. Increasing numbers of owners are turning to the private sector for operation and maintenance services. These services may consist of full contract operation and maintenance, contract maintenance, operator training, operation and maintenance troubleshooting, preparation and upgrading of maintenance manuals, start-up services, and/or operation and maintenance review during facility planning and design. When selecting a consultant for any of these sevices, the municipality should ensure that the consultant understands the functions of local government; that the consultant has qualified and certified operational personnel with significant hands-on experience with waste water treatment facilities, and that analytical laboratory capability is available. Where a specialized service is required, additional qualifications are necessary. (Carroll-FRC)
W81-04626

5G. Water Quality Control

CONSIDERATIONS FOR MONITORING WATER QUALITY OF THE SCHENECTADY AQUIFER, SCHENECTADY COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
R. V. Allen, and R. M. Waller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-202376, Price codes: A03 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 80-103, 1981. 28 p, 6 Fig, 7 Tab, 4 Ref.

Descriptors: *Water quality, *Monitoring, *Aquifer systems, Rivers, Water supply, Wells, Pumping, Recharge, Precipitation, Runoff, Water pollution sources, Water sampling, Chemical analysis, Evaluation, *New York, Schenectady County, Mohawk River.

Six public water-supply systems in Schenectady County, N.Y., obtain water from sand and gravel units that form a more or less continuous aquifer system contiguous to the Mohawk River. The aquifer is under water-table conditions and in hydraulic contact with the river, so that pumping wells induces recharge from the river. Direct recharge to the aquifer from precipitation and runoff occurs throughout the valley floor. Chemical analyses since 1972 have indicated no water-quality deterioration from toxic substances, including pesticides. Geohydrologic conditions at each of the six well fields were evaluated to determine the feasibility of a monitoring system to provide warning of contamination before it reaches a pumping center. Potential contamination sources in the area are landfills, gravel pits, industrial sites, and transportation corridors. Only two of the well fields have wells that could be used for monitoring; at most sites, two or more wells would need to be installed to provide minimal means of detecting contaminants migrating toward a pumping center. (USGS)
W81-04345

EVOLUTION OF ORGANIC AND MINERAL POLLUTANTS IN SURFACE WATER UNDER THE EFFECT OF LAGOONING,
Lille-2 Univ. (France).
F. Erb, J. Dequidt, A. Brice, J. C. L'Hopitault, and A. Philippo.
Water Science and Technology, Vol 13, No 1, p Tor 613-626, 1981. 13 Fig, 4 Tab, 20 Ref.

Descriptors: *Lagoons, *Water pollution control, *Water treatment, Trace metals, Pesticides, Organic compounds, Ponds.

The purpose of the study was to determine how humic matters can affect the efficiency of purification for track metals and organic micropollutants that accumulate in sludge and sediments. The area studied was a natural site in an experimental pond built along a natural waterway. The existing situation in the settled pond was investigated first, after which trace metals and a nitrogen-containing pesticide were introduced into the pond and the evolution of these pollutants was followed over the course of a month. The survey of water characteristics demonstrated a mineralization of about 575 mg/l, a hydrotimetric degree of 26-28 degrees, a fair aeration, an almost neutral pH, and a chemical oxygen demand of 50-70 mg/l. After the addition of trace metals and the pesticide it was noted that the distribution recorded for the mineral elements seemed to occur more regularly in each part of the pond. In general the elimination of the mineral pollutants required much more than 30 days. The evolution of the organic compound levels appeared to be more affected by various phenomena of adsorption, diffusion, stagnation and other processes brought about by fluid dynamics in the lagoon. Lagooning is therefore an excellent manner in which to reduce to a minimum sudden accidental pollutions. (Baker-FRC)
W81-04423

LAKE ERIE NUTRIENT CONTROL ASSESSMENT: AN OVERVIEW OF THE STUDY,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
C. E. Herdendorf.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-107070, Price codes: A17 in paper copy, A01 in microfiche. In: Lake Erie Nutrient Control Program: An Assessment of Its Effectiveness in Controlling Lake Eutrophication, Environmental Protection Agency Report EPA-600/3-80-062, July, 1980. p 1-63, 23 Fig, 13 Tab, 28 Ref.

Descriptors: *Nutrient removal, *Water quality control, *Lakes, *Eutrophication, *Limnology, Water quality, Sampling, Thermal stratification, Surveys, Water pollution control, *Lake Erie.

A three-year assessment of nutrient control efforts was conducted in the western and central basins of Lake Erie during the period June 1973 to June 1976. The objective of the study was to determine recent trends in lake eutrophication and water quality which may be related to recent attempts to control nutrient loadings to these basins. The assessment was accomplished by visiting approximately 50 stations at nearly monthly intervals during the ice-free periods. Over 25 water quality, meteorological and biological parameters were routinely determined shipboard or on samples collected at a typical station. Measurements were taken at several depths in order to characterize the various strata of water in the lake and to permit volume-weighted calculation of nutrient concentrations and quantities. Data from previous limnological surveys as far back as 1928 were compared with the results of the present study to establish longterm trends, as well as recent trends since the last comprehensive survey in 1970. The fundamental conclusion of this assessment is that during the first half of this decade no significant decrease in the loading of nutrients to Lake Erie has taken place. Therefore, during this period the concentrations and quantities of nutrients within the waters of the lake have remained relatively stable. An encouraging sign of nutrient control is that although no decreases have been observed, the constant increases which have taken place in preceding decades have been stopped.

W81-04476

PREDICTING PERCOLATION THROUGH WASTE COVER BY WATER BALANCE,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Geotechnical Lab.
R. J. Lutton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-175086, Price codes: A13 in paper copy, A01 in microfiche. In: Disposal of Hazardous Waste; Proceedings of the Sixth Annual Research Symposium, March 17-20, 1980, Chicago, Illinois. Environmental Protection Agency Report EPA-600/9-80-010, March, 1980. p 118-122, 3 Fig, 4 Tab, 6 Ref.

Descriptors: *Percolation, *Prediction, *Hydrologic budget, *Landfills, *Protection, Design criteria, Surface runoff, Precipitation, Evapotranspiration, Water storage, Infiltration capacity.

A basic part of designing a new soil cover or evaluating the effectiveness of an existing cover on solid and hazardous waste is a means of estimating the amount of water that percolates through it. The water balance method estimates percolation from the known or calculated factors of precipitation, runoff, evapotranspiration, infiltration, and storage in soil. The method does not rely on functional relationships, but the increments of water are added or subtracted for the chosen time interval. Both evapotranspiration and soil storage capacity may be based on calculations. However these need not be known with such accuracy as surface runoff, which has the greatest influence on percolation. The design of the cover should promote rapid sheet and rill runoff to the main ditches. The water balance method is simple but basically sound, and can be used for making design decisions. (Brambley-SRC)
W81-04493

PREVENT GROUNDWATER CONTAMINATION BEFORE IT'S TOO LATE,
Camp, Dresser and McKee, Boston, MA.
R. A. Weimar.
Water and Wastes Engineering, Vol 17, No 2, p 30-33, 63, February, 1980. 2 Fig, 1 Tab.

Descriptors: *Groundwater pollution, *Organic chemicals, *Chemical wastes, Industrial wastes, *Water pollution control, Municipal water, Wells, Organic compounds, Metals, Water pollution sources, Landfills, Waste disposal, Massachusetts, Pollutants, Toxicity, Regulations, Potable water, Sewers, Water quality.

Examples of groundwater contamination in Massachusetts are cited to illustrate the growing problem of organic chemicals in groundwater supplies. Contamination from hydrocarbon and chemical leaks and spills, septic tanks and leaching fills, sewer system leaks, and illegal chemical disposals have affected 25 municipal water supplies and many private wells in Massachusetts during the last 12 to 15 months. At Dartmouth, chloroform and dichloroethylene from 1,000 barrels of buried toxic wastes appeared in the town's water and caused a shutdown. Four municipal wells in Bedford were closed when trichloroethylene and dioxane from adjacent industrial sewers reached the water supply. At Provincetown a gasoline tank leak of thousands of gallons is threatening the municipal supply. Industrial disposal lagoons at Acton caused two municipal wells to be closed because of contamination by 1,1-dichloroethylene, trichloroethylene, and methylene chloride. Since much of an aquifer is usually polluted before contamination is detected, correction takes many years and much money. Possible preventive means include public education, aquifer protection, septic system management, prompt spill response, and storage regulations. (Cassar-FRC)
W81-04501

STABILIZATION AT MUNICIPAL LANDFILLS CONTAINING INDUSTRIAL WASTES,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 5B.

W81-04502

TOP-SEALING TO MINIMIZE LEACHATE GENERATION; CASE STUDY OF THE WINDHAM, CONNECTICUT LANDFILL,
SMC-MARTIN, King of Prussia, PA.
G. H. Emrich, W. W. Beck, Jr., and A. L. Tolman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-175086, Price codes: A13 in paper copy, A01 in microfiche. In: Disposal of Hazardous Waste; Proceedings of the Sixth Annual Research Symposium, March 17-20, 1980, Chicago, Illinois. Environmental Protection Agency Report EPA-600/9-80-010, March, 1980. p 274-283, 5 Fig, 2 Ref.

Descriptors: *Landfills, *Groundwater pollution, *Leachates, *Water pollution control, Revegetation, Surface sealing, Lysimeters, Monitoring, Remedies, Groundwater movement, Impervious membranes, Connecticut, Windham.

After the evaluation of more than 400 landfills, the Windham, Connecticut Landfill was selected for the implementation of a remedial action program. For the present study, additional wells were drilled to determine the thickness of the refuse, the depth of the water table under the landfill, the depth to bedrock and groundwater quality. An electrical resistivity survey was conducted in order to define the areal extent of the leachate plume. Remedial action alternatives evaluated for this site included regarding, revegetation, surface sealing, groundwater cutoff, and plume management. The first three methods proved to be the most effective. Suction lysimeters, pan lysimeters, staff gages, and monitoring wells were installed to determine water movement into the landfill and the effectiveness of the remedial measures. During the summer of 1979, a remedial program was implemented. The site was regraded, gas vents were installed, and 15 cm of sand and gravel were emplaced with an additional layer of 10 cm of fine-grained sand washings to protect the surface seal. A 20-mil PVC membrane seal was emplaced and covered with 46 cm of sand and gravel into which composed sewage sludge and leaves were disced. Revegetation will be accomplished by hydroseeding with a mixture of grasses. Monitoring is being conducted to determine the effectiveness of the membrane seal.
W81-04503

EXECUTIVE SUMMARY; AGRICULTURAL LAND USE WATER QUALITY INTERACTION: PROBLEM ABATEMENT, PROJECT MONITORING, AND MONITORING STRATEGIES,
Meta Systems, Inc., Cambridge, MA.
J. Kuhner.
Environmental Protection Agency Report, September, 1980. 16 p, 1 Fig, 4 Tab.

Descriptors: *Water quality, *Agricultural runoff, *Agriculture, *Water pollution prevention, *Land use, *Monitoring, Nonpoint pollution sources, Sedimentation, Eutrophication, Salinity, Pesticides, Pathogens, Organic matter, Nitrates.

An attempt was made to generalize agriculturally related nonpoint source pollution problems in various receiving waters and outline their potential remedies through modification of practices and introduction of new ones. The land uses selected were cropland, orchard/vineyard, grazing land, animal holding, and homestead; the receiving waters selected were lake/reservoir, small stream, river, bays (Great Lakes), and groundwater; and the water quality problems and their indicators were sedimentation, eutrophication, salinity, pesticides, pathogens, BOD/organic materials, and nitrates. The pollutants resulting from each land use and the pollutants which cause water quality problems were identified, and a simplified matrix developed of potential pollution problems in the different receiving water types resulting from agricultural activities. Pollution control methods can be categorized into five types: modification of land use activities without any additional structures; management strategies; on-site structures attached to or associated with ongoing land use; off-site structures capturing and/or modifying runoff and washoff; and streambank and instream control measures. A sound analytical investigation of the landwater interface is necessary prior to any monitoring, and the generated data should be fed back for improvement of the program. (Brambley-SRC)
W81-04504

WATER FILTRATION APPARATUS,
Kosaku Iida, Tokyo (Japan). (Assignee).
S. Kojima.
U.S. Patent No 4,218,322, 4 p, 2 Fig, 5 Ref; Official Gazette of the United States Patent Office, Vol 997, No 3, p 994, August 19, 1980.

Descriptors: *Patents, *Water treatment, *Water quality control, *Filtration, Separation techniques, Suspended solids, Plankton, Filters.

An apparatus for filtering raw water comprises a drum composed of disc-shaped end plates, horizontal member or members extended between the peripheries of end plates, and a water-permeable filter cloth with a long pile stretched around the member or members to form a drum-shaped filter body. A rotating shaft supports the drum and the drum is submerged in a raw water conduit. A discharge pipe connects with the inside of the drum. A hopper is located immediately below the filter body in the conduit and carries a pair of rolls on its upper edges for contact with the filter body. A drain pipe is connected to the hopper. The arrangement permits efficient removal of minute floating and drifting matter, such as plankton, from raw water, making possible a high rate of filtration with a very small space requirement. (Sinha-OEIS)
W81-04520

CONTAINER FOR RELEASING DRY CHEMICAL IN A BODY OF WATER,
Clarke Outdoor Spraying Co., Inc., Roselle, IL. (Assignee).
J. L. Clarke, Jr.
U.S. Patent No 4,218,843, 4 p, 2 Fig, 4 Ref; Official Gazette of the United States Patent Office, Vol 997, No 4, p 1184, August 26, 1980.

Descriptors: *Patents, *Pest control, *Public health, Water pollution control, Water quality control, Mosquitoes, Equipment.

The invention relates to devices for releasing mosquito larvae-killing material in a body of water. The invention provides a means for releasing the material which will not be buried by silt or the like and become embedded in the bottom, will not be an obstruction to current flow, and will not itself be carried away by any current. The device will remain dormant until such time as the water reaches it at which time it will rise to a generally upright position within the body of water and the mosquito larvae-killing material within a porous container will be showly released at a level intermediate the top and bottom of the water area. Current flowing through the water body will cause the device to assume a generally horizontal position so that it does not obstruct flow. The weight for the device is spaced from the flexibly connected to the pocket containing the larvae-killing material with the result that it is impossible for silt or the like to cover the chemical. (Sinha-OEIS)
W81-04521

KINETICS OF SEDIMENT OXYGEN DEMAND,
Illinois State Water Survey, Peoria.
For primary bibliographic entry see Field 2H.
W81-04558

WATER, SANITATION AND HEALTH - THE UN'S WATER DECADE IS LAUNCHED.
Water Services, Vol 85, No 1019, p 17, January, 1981.

Descriptors: *Water quality control, *Sanitation, *United Nations, Public health, Drinking water, Human diseases, Developing countries, Rural areas, Organizations, Education, Water supply development, Water resources development, *International Hydrological Decade.

The United Nations (UN) has begun the International Drinking Water and Sanitation Decade with the aim of providing clean water and basic sanitation for all people of the world over the next 10 years. Many developing countries suffer from inadequate and unsafe water supplies in rural areas. Conditions of sanitation in urban areas of developing countries are even worse. About 80% of all illnesses in these countries are attributed to waterborne diseases. Of all the childhood deaths in the Eastern Mediterranean Region, 40% are due to diarrheal diseases. Other water resource development projects are undertaken without proper attention to drainage and waste water disposal. More total investment in the water supply and sanitation sector will be required if the targets of the Decade are to be reached. The World Health Organization (WHO) is engaged in mobilizing latent resources, promoting cooperation among developing countries, training personnel, transferring appropriate technology, and improving administrative structures. The first WHO projects have been launched in Somalia and Egypt. Educational programs are also being operated by the UN organization of UNICEF in cooperation with WHO. Funding for water and sanitation programs is being provided by UN agencies and major funding organizations and development banks. (Geiger-FRC)
W81-04601

NEW PROBLEMS WITH UPLAND WATERS,
For primary bibliographic entry see Field 4A.
W81-04602

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

EXPLORING WAYS OF INCREASING THE USE OF SOUTH PLATTE WATER,
Colorado State Univ., Fort Collins. Water Resources Research Inst.
J. W. Labadie, and J. M. Shater.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-231896, Price codes: A02 in paper copy, A01 in microfiche. Information Series No 41, 1980. 8 p, 11 Fig. OWRT-A-039-COLO(4).

Descriptors: *Water management, *Water rights, *Storage reservoirs, *Computer simulation models, *Water use efficiency, Waste water treatment, Water resources development, Water right owner, Reservoir releases, Recreation demand, High-mountain reservoirs, Treated sewage effluent, Cache La Powdre River, Platte River Power Authority, Rawhide Power Plant, Colorado-Big Thompson Project, Reservoir evaporation, Water management area.

A computer simulation model was developed to test various alternative strategies of water management along the Colorado Front Range, where increasing population has resulted in ever-increasing demands for water by municipalities, industry and agriculture. This water management area uses a complex of high-mountain and plains reservoirs to store water, fulfill water rights commitments, and provide water recreation opportunities. Two water management alternative were tested using the computer simulation model. The first involved enhancement recreational facilities through a water exchange plant to keep filled some high-mountain reservoirs (where recreation demand is greater), while drawing more heavily on plains reservoirs and the remaining high-mountain reservoirs. In the simulated program, three high-mountain reservoirs were kept full while meeting all water rights commitments. In the second simulation treated sewage effluent was diverted from the city of Fort Collins to fill the 13,000-acre-foot cooling pond for the Rawhide Power Plant, scheduled for startup in 1985. If weather patterns of the past 25 years remain relatively stable, the model shows that the pond can be filled by 1985 and losses replenished without injury to other water-right owners. (Mullen-IPA)
W81-04310

NONPOINT SOURCE QUANTIFICATION AND ITS ROLE IN LAKE AND STREAM WATER QUALITY PLANNING,
Center for the Environment and Man, Inc., Hartford, CT. Div. of Environment Systems.
R. Ahmed, and R. Schiller.
Water Science and Technology, Vol 13, No 2, p Tor 783-801, 1981. 2 Fig, 14 Tab, 22 Ref.

Descriptors: *Nonpoint pollution sources, *Planning, *Model studies, Water quality, Computers, Lakes, Streams, Pollution load, Eutrophication, Trophic level, Cost analysis.

A simple model is presented for use in quantifying nonpoint sources of water pollution. Verification of the model was obtained using data collected from Lake Waramug and its tributaries. The model is suitable for use by planning agencies and consultants to provide a quantitative estimate of nonpoint sources of pollutants, and assessment of the role of nonpoint sources in lake and stream water quality, and a preliminary plan to control and abate nonpoint source pollutants in a cost-effective manner. The results are only approximations of the annual contributions on the nonpoint source polutants, but the model does provide a long-term estimate of pollutants and does not require extensive extrapolation of data as do sampling data analyses. Also, it locates specific sources of pollutants and details the primary causative factors. While this model is non-computer based, it is amenable to the use of computers. (Baker-FRC)
W81-04433

CLASSIFICATION OF GROUND-WATER STUDIES--A CRITICAL NEED FOR RESEARCH AND DEVELOPMENT IN THE EIGHTIES,
North Carolina Dept. of Natural Resources and Community Development, Raleigh. Div. of Environmental Management.
For primary bibliographic entry see Field 2F.
W81-04589

INTENSIVE FLOW METERING - IS IT REALLY COST EFFECTIVE,
PSC Professional Services Group, Inc., Norcross, GA.
T. J. Clark.
Water/Engineering and Management, Vol 128, No 4, p 43, April, 1981. 1 Tab.

Descriptors: *Flow measurement, *Cost analysis, Economic aspects, *Sewer Systems, Evaluation.

Costs and descriptions are given of two alternative methods of performing the subsequent steps of a Sewer System Evaluation Study (SSES) beyond gross flow monitoring at 20,000 ft intervals. The steps involved include intensive flow metering, gross flow isolation, intensive flow isolation, smoke testing, dye water flooding, and the preparation of the Phase-I interim report. Given an estimation of the total costs, it is demonstrated that the alternative which uses intensive flow metering is more costly. A closer look at the costs reveals that it takes $120,000 just to perform the intensive flow metering, but only $116,000 to do field work on a full 40% of the system. It is concluded that no amount of system elimination by intensive flow metering makes it a cost-effective step. (Baker-FRC)
W81-04620

6B. Evaluation Process

RECONNAISSANCE OF POTENTIAL FOR POTABLE GROUNDWATER SUPPLY AT KIPAHULU DISTRICT HALEAKALA NATIONAL PARK, MAUI, HAWAII,
Geological Survey, Honolulu, HI. Water Resources Div.
For primary bibliographic entry see Field 2F.
W81-04351

GROUNDWATER RESOURCES INVESTIGATION IN THE AMRAN VALLEY, YEMEN ARAB REPUBLIC,
Geological Survey, Reston, VA. Water Resources Div.
G. C. Tibbitts, Jr., and J. Aubel.
Available from the OFSS, USGS, Box 25425, Denver Fed. Ctr., Denver, CO 80225, paper copy $19.75, microfiche $4.00. Geological Survey Open-File Report 80-774, 1980. 138 p, 17 Fig, 1 Plate, 7 Tab, 17 Ref.

Descriptors: *Groundwater availability, *Arid lands, *Foreign research, Evaluation, Geologic formations, Aquifer characteristics, Water table, Transmissivity, Storage capacity, Water level fluctuations, Pumping, Drawdown, Water yield, Water use, Water quality, Chemical analysis, Water resources development, Planning, *Yemen Arab Republic, *Amran Valley(YAR), *U.S. Agency for International Development.

A program of hydrologic studies and exploratory drilling was conducted intermittently between 1974 and 1978 to evaluate the water-bearing properties of the unconsolidated alluvial sediments and associated rocks in the semi-arid Amran Valley basin, an 800-square-kilometer area in north-central Yemen Arab Republic. Inventory data from 395 wells were compiled, observation well and raingage networks were established and 16 standard complete chemical analyses were made for samples from selected wells. The water resources of the area were overexploited. The chemical quality of the water is generally good. Four aquifer tests were run to determine transmissivity and storage characteristics. The pumping tests show that groundwater occurs under semi-confined leaky-aquifer conditions in the valley fill. Wells drilled in the alluvial fill of the south-central part of the valley have the highest yields. Wells penetrating the limestone and volcanic rocks generally have little or no yield except in fracture zones. Basalt flows occur interbedded with the wadi alluvium at several depths. Cropping out rocks in the Amran Valley range in age from late Jurassic to Holocene. (USGS)
W81-04352

EPA'S CENTRALIZED TREATMENT PROGRAM,
Industrial Environmental Research Lab., Cincinnati, OH.
For primary bibliographic entry see Field 5D.
W81-04510

GROUP TREATMENT - OPTIONS AND ECONOMICS,
For primary bibliographic entry see Field 5D.
W81-04512

RECYCLING PROJECTS RECEIVE 'APPROPRIATE' NSF SUPPORT,
National Science Foundation, Washington, DC.
E. H. Bryan.
BioCycle, Vol 22, No 1, p 47, January/February, 1981. 2 Ref.

Descriptors: *Technology, *Research needs, *Recycling, Financing, Government supports, *Waste water management, Wetlands, Model studies, Costs, Economic aspects, Environmental effects, Ecosystems.

The term appropriate technology describes approaches to solving problems that do not require large investments of capital resources, and the National Science Foundation has been instructed by Congress to support appropriate technology. The innovative concept of using wetlands for waste water management is an example of an appropriate technology. The foundation supported a basic study to mathematically model the wetland ecosystem near the community of Houghton Lake in Michigan. Field verification of the ecosystem models followed. Then a pilot scale experiment was conducted to verify the ecosystem model's predictions of the effects that the placement of the secondary effluent from the area's waste water treatment plant would have on the wetland. Now, fullscale experimentation is in progress at Houghton Lake. The community's savings over a 20-year period were estimated to be $1.2 million

over land application, the next least-cost alternative. Other current research includes alternative methods and systems for curbside sorting of municipal solid wastes and a project to use wastes to help revegetate the areas damaged by the eruption of Mt. St. Helens. (Small-FRC)
W81-04565

HOW BENGALI VILLAGERS CHOOSE SOURCES OF DOMESTIC WATER,
Direccao Nacional de Aguas, Maputo (Mozambique).
J. Briscoe, M. Chakraborty, and S. Ahmed.
Water Supply and Management, Vol 5, No 2, p 165-181, 1981. 4 Fig, 5 Tab, 8 Ref.

Descriptors: *Water use, *Consumptive use, *Developing countries, Domestic water, Drinking water, Water quality, Well water, Water supply development, Project planning, Bangladesh.

Water use patterns in underdeveloped areas are frequently unknown, and this hampers the efforts of water use planners who attempt to predict who will use a new water source and for what purpose. An in-depth field study of family water use in a Bengali village was performed. Quality was found to be a powerful determinant, while conflicts over access to drinking water sources adversely affected the choices exercised by poor families. Until now, most water use planners have assumed that the most important factor governing the use of a drinking water source is the distance of the source from the home. Thus, improved sources must provide a quality of water which is perceived as good by the users. Public and communal sources should be emphasized to avoid quarrels. This would make higher quality of water more attractive to and available to poor families. These findings argue against a water supply program like the existing UNICEF program which is based on the installation of hand-pumped tubewells. Because tubewell water is high in iron and when used for cooking, turns rice black, no family surveyed used a tubewell for cooking water. (Small-FRC)
W81-04607

FEASIBILITY STUDY UNDERWAY FOR THE CONVERSION OF A MUNICIPAL WATER TREATMENT PLANT TO A LIQUID INDUSTRIAL WASTE TREATMENT FACILITY,
Water and Pollution Control, Vol 118, No 3, p 40, 43, March, 1980.

Descriptors: *Industrial wastes, *Water treatment facilities, Waste water facilities, Feasibility studies, Cost analysis, Planning, Dual purpose plants, Toronto area, Canada.

The conversion of a municipal water pollution control plant to a liquid industrial waste treatment facility was studied. Firms in the area currently ship their liquid wastes to either a plant in the Peel region, 50 miles away, or to Sarnia, about 200 miles to the west. The presence of a liquid industrial waste facility would do much to discourage illegal dumping in rural areas. A feasibility study has found economically and technically viable the plan to convert a water pollution control plant in Ajax to a liquid industrial waste treatment facility. The proposed site is 20 miles distant from most industries in Metro Toronto, Durham and the southern part of the York region. The plant will have a capacity of nine million gallons of waste a year. Extremely toxic or dangerous wastes such as PCBs and radioactive materials would not be handled at the plant. (Baker-FRC)
W81-04610

INTENSIVE FLOW METERING - IS IT REALLY COST EFFECTIVE,
PSC Professional Services Group, Inc., Norcross, GA.
For primary bibliographic entry see Field 6A.
W81-04620

WATER SYSTEM CONTROLLED BY LOAD MANAGEMENT PROGRAM, A CONSUMER-VOLUNTARY PROGRAM PAYS FOR THE SYSTEM IN ONE HOUR,
Water, Gas, and Light Commission, Albany, GA.
V. W. Rodemann.
Water/Engineering and Management, Vol 128, No 4, p 44, 49, 50, April, 1981. 1 Fig.

Descriptors: *Water treatment facilities, *Management planning, Water supply, Water conveyance, Costs, Water quality management, Chlorine, Water management, Resources management, Water metering, Monitoring.

Monitoring of water storage levels, pressures, flow and chlorine addition were features of the water department that were designed into an already existing load management package in Albany, Georgia. The original package was a load management system for the light department. Instantaneous and totalized flow of gas was also incorporated into the total system. Currently pressure and flow monitoring for the water system enhances fire protection service for Albany and surrounding Dougherty County. Manual random monitoring of chlorine addition was replaced by direct computer monitoring. The energy control system encompasses all three departments and operates as a unit of central control as a hybrid of two computer systems. Six functions are utilized at well sites operated by the computer system: chlorine gas pressures, water pressures, pump motor operation, well building entrance alarms, flow totalizer measurements, and chlorine gas detection. Additional remote monitors handle water levels in elevated storage tanks. After implementation a dramatic reduction in operational costs in the three departments was noted. Transportation costs were cut 41%, overtime hours by 10%. (Baker-FRC)
W81-04621

INFLUENCES OF SEWAGE AND TRADE EFFLUENT DISCHARGES ON WATER RESOURCES,
Anglian Water Authority (England).
For primary bibliographic entry see Field 5C.
W81-04638

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

WIDE-RANGE WATER METERING FOR FLUCTUATING SUBURBAN DEMANDS,
Public Works, Vol 112, No 3, p 90-91, March, 1981.

Descriptors: *Venturi meters, *Water metering, Varied flow, Drinking water, Water distribution, Michigan.

Water consumption loads used to be fairly uniform geographically in Detroit, Michigan, but recent economic upheavals have reduced water flows to levels not measureable by conventional measuring techniques. Formerly there was a balance between residential and industrial facilities, there is a very wide range of levels to be measured. A mainline metering system known as the Universal Venturi Tube metering valve was installed, which as a scale range of 90 to 1. A typical 24-inch unit will measure between 0.34 and 34 mg. A seven-digit, straight-reading totalizer can be operated by transmitters on either venturi. Registered totals read directly in gallons, cubic feet, or other desired units. Water flow in the suburban portion of the Detroit service area is 18.5 billion cubic feet per year, nearly half the total amount of water used in Michigan. Accurate metering is essential. (Small-FRC)
W81-04471

6D. Water Demand

WATER RESOURCES OF THE MAKAH INDIAN RESERVATION, WASHINGTON,
Geological Survey, Tacoma, WA, Water Resources Div.
N. P. Dion, K. L. Walters, and L. M. Nelson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-132938, Price codes: A04 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 80-15, 1980. 54 p, 11 Fig, 14 Tab, 14 Ref.

Descriptors: *Water supply, *Water quality, *Rainfall-runoff relationships, Surface waters, Streamflow, Fisheries, Groundwater availability, Wells, Water yield, *Washington, *Makah Indian Reservation, Indian reservation.

The residents of the Makah Indian Reservation, Wash., depend on the stream of the area for their fisheries and domestic water supply. The temporal distribution of streamflow in the study area is closely related to the amount and distribution of rainfall. In a year of average precipitation about three-quarters of the streamflow can be expected to occur during the 6-month period October-March. Although the chemical quality of water in streams is suitable for domestic puposes, State water-quality standards are not met by most streams at certain times of the year because of excessibe fecal-coliform bacteria and turbidity levels. Nutrient concentrations in the Waatch and Sail Rivers are sometimes high enough to cause nuisance-plant growth. Suspended-sediment concentrations were low in all streams sampled. Groundwater is known to occur only in sand and gravel layers that underlie the lowlands of the reservation. Individual wells are capable of yield as much as 90 gallons per minute. Several wells in the Neah Bay area have been abandoned because of inferior water quality. In coastal areas, and individual domestic well on each 10-acre allotment should provide sufficient water for the occupants without danger of seawater intrusion. (UGS)
W81-04326

WATERWORKS EXPANSION SHOULD END RICHELIEU VALLEY SHORTAGES,
Water and Pollution Control, Vol 118, No 2, p 23, February, 1980.

Descriptors: *Water demand, *Water supply development, Richelieu Valley, Quebec, Canada, Water resources development, Water delivery, Water shortage, Water deficit, Water treatment facilities.

Chronic water shortages to the South Shore towns of the Richelieu Valley should be lessened through the opening of a $4.3 million waterworks expansion project. The expansion comprises a new intake from the Richelieu River, new pumping stations for raw and treated water and an addition to the existing Otterburn Park filtration plant. The new intake at Otterburn Park was designed to meet an eventual demand of 50 million gallons a day, thus precluding the need for subsequent enlargements. The plant has seven filtration beds. Maximum capacity of the treated water pumping station is 14.6 million gallons/day at a 208 foot head. The plant is semi-automatic, and a substantial share of the construction cost was supported by government at provincial and federal levels. (Baker-FRC)
W81-04609

6E. Water Law and Institutions

DISTRICT OF COLUMBIA FIVE-YEAR WATER RESOURCES RESEARCH PROGRAM PLAN, 1982-1987,
District of Columbia Univ., Washington. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-234882, Price codes: A11 in paper copy, A01 in microfiche. Report No 24, November, 1980. 250 p, 35 Fig, 32 Tab, 124 Ref.

Descriptors: *Research priorities, *District of Columbia, *Water resources development, *Water management, *Geography, *Geohydrology, *Biological properties, *Water quality, *Water allocation, *Toxicity, *Waste water treatment, Water conservation, Chemical sludge, Surface runoff, Technology transfer, *Five-year plans, Hydrological characteristics, Meteorology, River confluence, Toxic and hazardous subtances, Tributaries, Research and development, Potomac estuary biota, Water quality monitoring.

The report describes the water resources situation in the District of Columbia. Research needs are identified, a 5-year research and development program plan for the D.C. Water Resources Research Center is presented. Geological, meteorological, biological and hydrological characteristics are described as well as surface and groundwater resources. Water resources problems are categorized and prioritized, and related agency activities are presented. The 5-year plan deals with water quantity and other related problems. Three dimensional illustrations show details of physiography for the course of the Potomac River, physiographpic provinces and geographic and geologic feature of the D.C. region, and cross sections of the Potomac River bed from 9 miles above Great Falls to the Atlantic Coastal plain. Conditions of high flow and low flow in the Potomac and Anacostia Rivers, which supply the District of Columbia, are discussed, along with conflicts over use of their water with neighboring Maryland and Virginia. Major benefits expected from the 5-year plan, in addition to water management, are technology transfer, information dissemination, manpower research, public awareness, and training program development (Mullen-IPA)
W81-04306

WEST VIRGINIA WATER RESEARCH 1981-1985,
West Virginia Univ., Morgantown. Water Research Inst.
S. A. Cohen, L. W. George, A. L. Mierke, and D. Harbecevich.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-231888, Price codes: A04 in paper copy, A01 in microfiche. Planning Report 1 (Draft Report) 1980. 53 p 3 Tab.

Descriptors: *Research priorities, *West Virginia, *Water resources, *Pollution load, *Acid mine drainage, *Water pollution, Carcinogens, Surface runoff, Precipitation, Eastern Panhandle, Precipitation differential, Alleghany Mountains, Appalachian Plateau, Potomac River Basin, Groundwater reservoirs, Evaporation, Plant transpiration, Rock strata, Groundwater resource, *Five-year plans.

The five-year plan for the West Virginia Water Research Institute includes an overview of the State's water resources, an analysis of the use of water resources in West Virginia, a description of water-related land planning and development activities, a ranking of the State's water resources problems, and a research agenda for the Water Research Institute. West Virginia's water resoures and problems are analyzed, as well as the capabilities of the Institute; the resultant five-year plan related the Institute's capabilities to the State's most pressing water resource problems. The greatest pollution problem in West Virginia is acid mine drainage from coal mines. Other water quality problems are domestic organic pollution (particularly in rural areas), the presence of toxins and carcinogens in the Kanawha River, and heavy discharges of industrial organics. The five-year plan is narrowly focused because the State's resources are mimimal, and acid mine drainage as severe as in West Virginia in not adequately addressed nationally. (Mullen-IPA)
W81-04309

ALASKA'S WATER RESOURCES PROBLEMS AND RESEARCH NEEDS, INSTITUTE OF WATER RESOURCES, FIVE-YEAR RESEARCH PLAN, JUNE 1980,
Alaska Univ., Fairbanks. Inst. of Water Resources.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-231920, Price codes: A03 in paper copy, A01 in microfiche. Report, June, 1980. 30 p 1 Fig, 1 Tab, 31 Ref.

Descriptors: *Research priorities, *Alaska, *Native American water rights, Geohydrology, Water right, Erosion, Sedimentation, Subarctic environment, Permafrost, Water supply, Toxic substances, Leachate, Subsurface regime, Surface mining, Pollution, Dissolved oxygen, Suspended solids, Dissolved solids, Turbidity, Heavy metals, Waste management, Alternative energy technology, Reservoir mangement, Recreational lakes management, Fisheries management, Freshwater system, Alaska Water Study Committee, Alaska Department of Envionmental Conservation, Nonpoint pollution sources, *Five-year plans.

A number of organizations have done important work on Alaskan water resources and have served as precursors and supportive contemporaries to the Alaska Institute of Water Resources; the Alaska Water Study Committee, the Inter-Agency Hydrology Committee for Alaska, the Water Resources Board, and Alaska chapters of the American Water Resources Association, the National Water Well Association, and the Water Pollution Control Federation. These organizations and citizens groups, special interest groups, and municipal organizations have greatly aided the Institute of Water Resources in identifying areas of concern such as flood plain management, frozen soils, water supply, waste disposal, toxic trace element mangement, aquatic resources management, and coastal zone management. More recent assessments also include instream flow requirements; water conservation; conflicts among power, irrigation, and fisheries, and Native American water rights. The Institaute of Water Resources has initiated a 9-point research program for water resource development over the next five years, concentrating on industrial and urban resource needs. (Mullen-IPA)
W81-04314

FIVE-YEAR WATER RESOURCES RESEARCH PLAN 1982-1987,
Iowa State Water Resources Research Inst., Ames.
M. D. Dougal, and T. A. Austin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-231938, Price codes: A04 in paper copy, A01 in microfiche. Report Submitted to Office of Water Research and Technology, October, 1980. 70 p 5 Fig, 3 Tab, 1 Append.

Descriptors: *Research priorities, *Iowa, *Water resources, *Precipitation, *Groundwater availability, Agriculture, Streamflow, Hydrology, Meterology, Vadose zone, Bedrock aquifers, Shallow-aquifers, Water quality, Water quantity, Water quantity, Irrigation, Hazardous waste, Leachates, Solid waste, Surface water, Point sources of pollution, Crop yields, Floodplain, Annual flooding, Evapotranspiration, Groundwater recharge, Evaporation, Electric power generation, *Five-year plans.

Iowa currently has abundant water resource, but the visible trend is toward possible shortage in the next 40 years; projected water withdrawal will rise from 3.68 billion gallons per day (1975) to 27.5 billion gallons per day (2020). A large water user is agriculture, in which Iowa is one of the leading states. Average annual precipitation varies from 34 inches in the southeast to 25 inches in the northwest, with 70% occurring during th growing season. Shallow groundwater quality and quantity have been declining, especially in the southwest and west. The largest pollution is sediment from topsoil erosion; an estimated 50% of valuable topsoil has been lost in the last 100 years. The largest single water use is in electric power generation (74% in 1975), drawn mostly from the Mississippi and Missouri Rivers. The study evalutes seven aspects of Iowa water resources; (1) water quality, (2) water supply, (3) flood plain management, (4) recreation, fish, and wildlife,(5) energy production, (6) navigation, and (7) agriculture. (Mullen-IPA)
W81-04315

MASSACHUSETTS' FIVE-YEAR WATER RESOURCES RESEARCH NEEDS, 1982-1987,
Massachusetts Univ., Amherst. Water Resources Research Center.
E. L. Goldstein, J. S. Larson, and P. J. Godfrey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-231961, Price codes: A05 in paper copy, A01 in microfiche. Publication No 122, Special Report, 1980. 81 p, 1 Fig, 8 Tab, 11 Append. 14-34-0001-0131.

Descriptors: *Research priorities, *Massachusetts, *Groundwater resources, *Water conservation, *Water resources research, Floodplain management, Riverine flooding, Groundwater development, Water quality, Water quantity, Information transfer, Resource management, Resources administration, Policy and program development, Eutrophication, Environmental quality, Chemical contamination, Acidity, Precipitation, *Five-year plans.

In light of the approaching water resources crisis in Massachusetts, at a time that the ability of the Water Resources Research Center to provide fundamental research is being seriously eroded by inflation, this report is intended to serve three major needs for the next five years; contribute to a coordinated research effort by Federal, State, and academic institutions; and educate the public to the critical nature of the water resources problem. Massachusetts has no single, dramatic water resource problem; instead, there is a patchwork of local and regional problems of water quality, water quantity, and conflicts over the use of water. The Massachusetts five-year plan treats the water resources problem under eight categories; Groundwater Development and Protection; Conservation; Water Quality and Quantity; Modernization of Supply Systems; Drinking Water Quality and Treatment; Information Transfer and Management; Resource Administration; and Water Resources Policy and Program Development. (Mullen-IPA)
W81-04318

WATER PROBLEMS AND RESEARCH NEEDS FOR NEW MEXICO,
New Mexico Water Resources Research Inst., Las Cruces.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-231979, Price codes: A04 in paper copy, A01 in microfiche. Report, September, 1980. 68 p, 3 Fig, 1 Tab, 7 Ref.

Descriptors: *Research priorities, *New Mexico, *Water resources, *Surface water availability, *Groundwater availability, Precipitation, Mineralized groundwater, Saline water, Freshwater, Underground water basins, Water rights, Groundwater aquifers, Surface runoff, Evaporation, Irrigation, Livestock water, Freshwater withdrawals, Water conservation, Evapotransiration, Recoverable supply, Seepage, Aquifer recharge, Drainage basin, Rio Grande Basin, Pecos River Basin.

New Mexico faces serious water problems in the years ahead. Surface water supplies are scarce and virtually fully appropriated, so that no further appropriations can be made unless some existing water rights are retired. Fresh groundwater is seriously depleted in some parts of the State from heavy drawdown. Existing fresh water supplies will not be adequate to meet all projected demands over the next 40 years. Significant aquifer recharge occurs only in the Rio Grande basin, where unconsolidated sand and gravel reaches a charge thickness of up to 10,000 feet. Agricultural use (irrigation, livestock water, and stockpond and reservoir evaporation) annually depletes about 90% of fresh water withdrawals. It is unlikely that New Mexico will discover new water resources over the next few decades, so that water conservation in agriculture is critically important. Water quality degradation by human and natural causes is a problem in many areas. Mineralized groundwater is very abundant, but feasible large scale use has not been developed. The ability to substitute mineralized or saline water for fresh water presents the major opportunity for New Mexico's future. (Mullen-IPA)
W81-04319

FIVE-YEAR RESEARCH AND DEVELOPMENT PLAN,
Maryland Univ., College Park. Water Resources Research Center.
E. P. Karlander.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-231987, Price codes: A06 in paper copy, A01 in microfiche. Report, 1981. 105 p, 15 Fig, 12 Tab, 55 Ref.

Descriptors: *Research priorities, *Maryland, Groundwater, Groundwater availability, Rainfall,

Precipitation, Eutrophication, Water conservation, Water resources, Freshwater, Saline water, Electrothermal cooling, Irrigation, Appalachian Mountains, Alleghany Plateau, Eastern Shore, Surface runoff, Streamflow, Groundwater aquifers, Susquehana River Basin, Potomac River, Patapsco River, Anacostia River, Choptank River, Chesapeake Bay, Wetlands, Estuary, Sedimentation, *Five-year plans.

Three major areas of research were selected, taking into consideration research needs, other research programs, and research resources of time and funding. Area 1 is Toxic and Chemical Wastes in the Maryland Water Supply. Research in this area deals with the kinds, amounts, sources, fates, and interaction involved. Area 2 is Nutrients and Eutrophication of Maryland Waters. The research program is similar to area 1. Area 3 is Sedimentation in Maryland Waters. Investigation includes sources, prevention, recovery, and effects on the biota and habitats of various sediment depositions. Maryland water resources include 42 inches of annual precipitation; fresh and saline surface waters of rivers, lakes, large areas of wetlands, and an extensive extuarine system culminating in Chesapeake Bay; and groundwater aquifers that extend under nearly all portions of the State. Domestic use accounts for 68% of groundwater use, but only 8% of total water use. The greatest single usage is in electrothermal cooling, using primarily saline surface water, which is 64% of the total supply. (Mullen-IPA)
W81-04320

COMBATING RIVER POLLUTION TAKING THE RHINE AS AN EXAMPLE,
Amsterdam Water Works (Netherlands).
C. van der Veen, and J. Huizenga.
Water Science and Technology, Vol 13, No 2, p Tor 1035-1059, 1981. 10 Fig, 13 Tab, 18 Ref.

Descriptors: *International waters, *International commissions, *River systems, Water pollution sources, *Water pollution control, *Rhine River, Water use.

Problems with water use and pollution of the Rhine River, an international water source, are discussed. The catchment area of the Rhine extends through 10 countries; Switzerland, France, the German Federal Republic, and the Netherlands are the major ones. The river is the major artery of Western Europe. The Federal Republic of Germany draws off more water for cooling and industrial use than the other nations combined. The major user of the water for agricultural purposes is the Netherlands. The International Commission for the Protection of the Rhine against Pollution has, among other actions, passed an International Treaty on the Chemical Pollution of the River Rhine, which limits the discharge of dangerous substances. For the proper implementation of a water quality management program, an inventory of all discharges into the Rhine is needed. There are still no binding standards for the quality of the Rhine water in the various countries. Thus, the countries must decide either to clean up the Rhine or to use it as a waste disposal sewer. (Small-FRC)
W81-04440

NAVIGABLE WATER NOT ALWAYS SUBJECT TO FREE PUBLIC ACCESS,
M. McGuinness.
Natural Resources Journal, Vol 21, No 1, p 161-168, 1981.

Descriptors: .

The legal decisions presented in this note center around the improvements made by a developer to Kuapa Pond. The Pond had been a shallow lagoon on the Island of Oahu. It had separated Maunalua Bay and the Pacific Ocean by a natural barrier beach. The pond was not navigable. After dredging and filling operations had been carried out by the developer, a 200-ft wide channel had been dug which connected the pond to the Bay. Presently, Kuapa Pond is the center of a 6,000 acre private marina called Hawaii Kai, comprised of 22,000 residents and 669 boats. The United States filed suit to determine whether petitioners were required to obtain Corps of Engineers authorization for future improvements in accordance with paragraph 10 of the Rivers and Harbors Act. The question was also raised as to whether petitioners could restrict access to what had become navigable water of the United States and should be open to the public under the doctrine of navigational servitude. The case ultimately reached the Supreme Court, where it was determined that although the dredged pond fell within its definition of navigable waters, the concept of federal navigational servitude did not itself create a blanket exception to the takings clause of the Fifth Amendment. Congress could prescribe rules governing petitioner's marina in furtherance of trade and commerce. However, the government could not create a public right of access to the improved pond without first invoking its power of eminent domain and paying just compensation to the owner. (Baker-FRC)
W81-04458

FEDERAL PENALTIES APPLY TO POLLUTION OF INTERMITTENT STREAMS,
A. F. Wright.
Natural Resources Journal, Vol 21, No 1, p 181-183, 1981.

Descriptors: *Water law, *Pipelines, *Oil spills, Cleanup operations, Water pollution control, Federal jurisdiction, Legal aspects, *Navigable waters, Costs.

Legal action was taken following the inadvertent breaking of a pipeline owned by Texas Pipe Line Company, causing a spill of 600 barrels of oil into an unnamed creek in Atoka County, Oklahoma. The creek fed into Caney Creek with a small flow, and this in turn fed the Red River via Clear Boggy Creek. While the company was not at all at fault for the spill, and through its quick action recovered all but 90 barrels of the spill, the United States District Court for the Eastern District of Oklahoma entered summary judgment against the company, upholding a fine of $2500 assessed by the United States Coast Guard under the Federal Water Pollution Control Act for polluting navigable waters. Although there was some question concerning the definition of navigable waters, this ruling was upheld regarding the classification of the unnamed creek under navigable waters. The question of the amount and purpose of the fine was discussed at some length. Future decisions may reach the issue of the relationship between fines and actual cleanup costs. (Baker-FRC)
W81-04459

TEXAS VS. NEW MEXICO: THE PECOS RIVER COMPACT LITIGATION,
M. C. O'Leary.
Natural Resources Journal, Vol 20, No 2, p 395-410, April, 1980. 2 Fig, 1 Tab, 75 Ref.

Descriptors: *Law enforcement, *Interstate compacts, *Interstate rivers, Legal aspects, Rivers, Groundwater management, Texas, New Mexico, Groundwater availability, Groundwater budget, Pecos River, Aquifers, Water rights, Pumping.

One of the most successful compacts designed to aid in solving problems of use regarding interstate waters has been the Pecos River Compact between Texas and New Mexico. The Compact was made in 1948; in 1975 Texas filed suit against New Mexico based on dissatisfaction with the activities of the commission entrusted with applying the provisions of the compact. Most of the land surrounding the river is semi-arid, with the demand for water exceeding the supply. Much of the watershed is used for livestock grazin, but where water is available irrigated farming predominates. Historically a law regulating the use of groundwater basins was passed in New Mexico, but no such law existed in Texas. The need for water storage was the immediate cause of the problem which was resolved with the passage of the compact. The crucial aspect of the compact was the clause that New Mexico shall not deplete the flow of the Pecos River at the New Mexico-Texas state line below an amount which will give to Texas a quantity of water equivalent to that available to Texas under the 1947 conditon. The current dispute will turn on the definition given to the phrase 'the 1947 condition'. (Baker-FRC)
W81-04461

CITIZEN PARTICIPATION IN PLANNING WATER STORAGE,
DeLeuw, Cather and Co., Washington, DC.
G. L. Groat.
Public Works, Vol 112, No 3, p 77-81, March, 1981. 7 Fig.

Descriptors: *Public participation *Site selection, *Water storage, Planning, Public hearing, Reservoir siting.

The need to involve the public in planning, siting, and design of water storage structures is discussed. Citizen participation is necessary for an uninterrupted and smoothly operating storage construction program. This involvement reduces the likelihood of legal challenges to the construction and other delaying tactics. It can improve the quality of siting and design plans, as the citizens' needs and tastes will be known. People should be informed at the earliest possible date of the proposed site, structure type, size, and cost trade-offs. Provisions should be made for community participation such as town meetings. Guidelines should be developed, and an invitation should be extended to citizens for comment and agreement. Multiple use is one way to make a project attractive to the community. For example, in Vernon, California, a 10 MG reservoir cover is used as a parking lot and civic center. Any officials, agencies, or groups should be involved that indicate an interest in the appearance or multiple use opportunities of proposed structures. Inclusion of these individuals in the design process may assure a non-controversial construction program. (Small-FRC)
W81-04468

THE RIVER RHINE AS AN EXAMPLE OF INTERNATIONAL ENVIRONMENTAL POLICY IN EUROPE,
Rijncommissie Waterleidingbedrijven, Amsterdam (Netherlands).
L. J. Huizenga.
Water Service, Vol 84, No 1015, p S17-S20, September, 1980. 4 Fig, 5 Tab.

Descriptors: *River regulations, *International commissions, *International agreements, *Water pollution control, Salinity, Mine wastes, Toxicity, Chemical waste, Rhine river.

International negotiations are necessary in order to combat pollution of the Rhine River, which flows through Switzerland, France, the Federal Republic of Germany, Luxembourg, and The Netherlands. The International Commission for the Protection of the Rhine against Pollution was formed by these nations and investigates the nature, quantity, and origin of pollution of the Rhine. It also suggests methods by which member nations can help in the cleanup of the river. The commission has produced two international agreements: one will decrease the amount of salt discharged by French potash mines in Alsace, and the second stipulates various toxic chemical substances which should no longer be discharged. The Salt Convention has not been ratified, but the Chemical Convention was ratified by all members and went into effect in February 1979. The oxygen concentration of the river has been improved through the building of sewage treatment plants by member nations. This improvement was the result of national actions, not international agreement. More work is needed before the Rhine can be a source of dringking water for Europe. (Small-FRC)
W81-04472

AWT--BLACK BOX OR PANDORA'S BOX,
D. V. Feliciano.
Journal of the Water Pollution Control Federation, Vol 52, No 9, p 2304-2310, September, 1980. 1 Fig.

Descriptors: *Tertiary waste water treatment, *Regulations, *Water quality, Water policy, Water

pollution treatment, Water pollution control, Waste water treatment, Costs, *Cost-benefit analysis, Municipal waste water, Advance waste water treatment.

Enthusiasm to improve water quality has prompted some municipalities to choose advanced waste water treatment (AWT). In some cases unexpected problems and questions on costs vs. benefits have arisen. AWT is attractive because treated water quality is excellent and because governmental policy encourages quick spending of allocated funds once a program is approved. AWT, especially at smaller plants, costs ten times as much per pound of oxygen-consuming material as secondary treatment. Costs of removing more pollutants from a waste stream escalate with the percentage removed. Often, AWT is not applicable to a community's needs; for example, the water criteria may be designed to protect a species not normally present, the source of pollution may be natural or seasonal and not mitigated by AWT, pollution concentration may be so dilute or unreactive that AWT would not improve water quality noticeably, and pollutants within a given chemical class may behave differently, some being innocuous. Conflicts are inherent in the policies. The Environmental Protection Agency (EPA) has been placed in a position where it must refuse funds for AWT that will not significantly improve water quality and still require AWT construction to achieve water quality standards. Federal funds for construction may be withheld and then fines imposed for violating water quality standards. The Illinois vs. EPA case is cited. Although this decision changed EPA review policies so that only projects costing more than $3 million would be critically reviewed, there have been indications that this decision would eventually be reversed. (Cassar-FRC)
W81-04618

SMALL WATER SYSTEMS: WHAT CAN GOVERNMENT DO FOR THEM,
Environmental Protection Agency, Washington, DC. State Programs Div.
A. Levin, and H. F. Hanson.
Water/Engineering and Management, Vol 128, No 3, p 77-78, 98-99, March, 1981. 9 Ref.

Descriptors: *Drinking water, *Management planning, *Government supports, Political aspects, Economic aspects, Government finance, State programs, Regional planning, Federal programs, Water treatment facilities, *Water supply systems.

Federal, State, and local governments are providing assistance to community drinking water systems in the areas of operator training, capital expenditures, monitoring, new technologies, operating problems and costs, recordkeeping, public notification, and increased regulation. The most familiar types of assistance are those activities specifically directed toward problem areas, such as technical assistance, demonstration projects, contracts and studies, and emergency assistance. State and regional offices of the Environmental Protection Agency (EPA) have many programs designed to assist communities in complying with the Safe Drinking Water Act and to provide technical assistance. Other activities of the EPA include demonstration projects, the Model State Information System, and the National Rural Water Association Training and Technical Assistance Program. Regionalization and consolidation of water system planning and operation is being encouraged both to realize economies of scale and to concentrate water supply talent. The development of junior college curricula in water treatment technology and water treatment instructor education is also being encouraged. State programs include innovative techniques for settling priorities and distributing available funds to water supply systems and acceptance of Primary Enforcement Responsibility, with attendant grant funds from EPA. (Carroll-FRC)
W81-04627

6G. Ecologic Impact Of Water Development

ECOLOGICAL CHARACTERIZATION OF THE SEA ISLAND COASTAL REGION OF SOUTH CAROLINA AND GEORGIA; RESOURCE ATLAS,
Fish and Wildlife Service, Biological Services Program Report FWS/OBS-79/43, September, 1980. 60 p, 45 Fig, 7 Append. 14-16-009-77-016.

Descriptors: *Coasts, *Maps, *Natural resources, *Ecology, *Wetlands, Social aspects, Economic aspects, Geography, Groundwater, Environmental effects, Planning, Geology, Urban areas, Physiographic provinces, South Carolina, Georgia, *Sea Island Coastal Region, Atlas.

The Sea Island Coastal Region of South Carolina and Georgia is rich in natural resources, which are valuable to a variety of often competitive uses. The Sea Island Ecological Characterization is designed to provide information that will assist decision makers in evaluating and predicting impacts of man-induced perturbations (such as oil and gas development, dredging and filling, water resources projects) and in general coastal zone planning. This atlas, an oversized document, is a companion volume to the Characterization text, and provides a convenient format for the location and identification of pertinent physical, socio-economic and ecological features of the Sea Island Region. The project includes the coastal tier of counties between the Georgetown/Horry county line in South Carolina, south to the St. Marys River on the Georgia/Florida border, and the three lowland counties of Dorchester, Berkeley, and Effingham. An overview of transportation systems, utilities transmission pathways, and natural and recreational resources is presented at 1:250,000. The urban series maps were drawn at 1:24,000, then reduced to fit the atlas plate. Several islands are treated in a special series describing erosional history, shoreline changes, and problem areas. Other geological features such as groundwater, stratigraphic profiles, and gravity contours are illustrated in the geology series of plates. At 1:100,000 scale, two series of maps display data on cultural aspects and physiography. The physiographic series is designed to illustrate various physical features and to categorize wetlands, ecological habitats, and major types of land use. (Moore-SRC)
W81-04400

THE EFFECTS OF THE LAND RECLAMATION AND FRESHENING PROJECT ON THE WATER ENVIRONMENT IN LAKE NAKANOUMI--THE PRIOR INVESTIGATION AND ITS PROBLEMS(IN JAPANESE),
Shimane Univ., Matsue (Japan). Dept. of Agricultural Chemistry.
H. Ohtake, Y. Date, K. Kondo, and Y. Seike.
Japanese Journal of Limnology, Vol 41, No 3, p 153-162, July, 1980. 10 Fig, 5 Ref.

Descriptors: *Water quality, Phytoplankton, Zooplankton, Irrigation water, *Land reclamation, Lakes, Brackish water, Water pollution effects, Aquatic life, Salinity, *Lake Nakanoumi, Japan, Dikes, Environmental effects.

In 1980 Lake Nakanoumi, Japan, a brackish lake, was scheduled to be converted to a fresh water lake for storing irrigation water for expanding agricultural lands. This paper reviews highlights of previous studies used to forecast impacts of this freshening project on the lake environment. In recent years water quality has deteriorated, and lake hydraulics have been altered by dike construction. Figures depict some of the data on water quality and aquatic life in years prior to the completion of the project--zoo- and phytoplankton distribution patterns, annual cycle of salinity, and annual cycle of oxygen saturation. (Cassar-FRC)
W81-04631

INTERDISCIPLINARY EXPEDITION TO THE OKAVANGO SWAMPS,
Rhodes Univ., Grahamstown (South Africa).
R Fincham.
South African Journal of Science, Vol 76, No 3, p 101-102, March, 1980. 1 Fig, 8 Ref.

Descriptors: *Dredging, *Water resources development, Ecological effects, Deltas, Swamps, Rivers, Botswana.

An interdisciplinary expedition from Rhodes University studied the Okavango swamps and delta region of Botswana. Some observations and conclusions relating to water resources were made. Dredging of the Boro River to assure water supply for a diamond mine reduced species diversity and production of aquatic plants. Measurements of river flow in the delta region revealed that some distributaries have changed in flow rate to the benefit of some regions and the detriment of others. Management planning must consider future shifting of these river flows. (Cassar-FRC)
W81-04643

GEOGRAPHICAL VARIATIONS IN BODY SIZE, BROOD SIZE AND EGG SIZE OF A FRESHWATER SHRIMP, PALAEMON PAUCIDENS DE HAAN, WITH SOME DISCUSSION ON BROOD HABITAT,
Kyoto Univ. Otsu (Japan). Otsu Hydrobiological Station.
M. Nishino.
Japanese Journal of Limnology, Vol 41, No 4, p 185-202, October, 1980. 15 Fig, 1 Tab, 32 Ref.

Descriptors: *Adaptation, *Shrimp, *Reproduction, Growth stages, Population, Water temperature, Broods, Lakes, Lake Biwa, *Japan, Aquatic animals, Invertebrates, Animal physiology, Rivers, Environmental effects, Geographical regions, *Freshwater shrimp.

The body size, egg size and brood size of the freshwater shrimp Palaemon paucidens varied among the populations sampled in 28 inland waters in Japan. Although waters included oligotrophic to eutrophic lakes, farm ponds, bogs, moats, brackish water, and the middle and mouths of rivers, at latitudes from 30 to 45 degrees, variations appeared to depend on water temperatures. The measurements that are similar within one population are egg size, relative brood size, and relative brood weight. Among the different populations egg size varies and mean brood size and mean relative brood size vary within limited ranges. Relative brood weight varies little among populations. Brood size increases with body size, and mean relative brood size is inversely proportional to mean egg size. Colder waters produce larger mean egg size and smaller mean relative brood size. Shrimp in oligotrophic Lake Biwa, latitude 35 degrees 15 minutes, do not fit the general trends. They have small body size, small eggs, and an exceptionally large relative brood size. This lake is the largest in Japan, maximum depth 103.9 meters, area 674.4 sq km. Although surface temperatures in Biwa are similar to those in other lakes, the deep water where shrimp spend the winter is less than 10C all year. These cold temperatures lead to retarded growth and high larval mortality. Animals transplanted from Lake Biwa into other lakes apparently do not survive, and the high relative brood size may be considered its adaptive strategy of allocation. (Cassar-FRC)
W81-04644

7. RESOURCES DATA

7B. Data Acquisition

APPLICATION OF NEW METHODS FOR ROUTINE MEASUREMENT OF AQUATIC ORGANICS,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
W. J. Maier.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-231995, Price codes: A02 in paper copy, A01 in microfiche. Final research project report, March 30, 1981. 138 p, 42 Fig, 29 Tab, 70 Ref, 2 Append.

Descriptors: *Research priorities, *Aquatic organics, *Analytical methods, *Mississippi River organics, *TOC concentrations, Size fractionation, BOD estimates, UV characterization, UV absorbors, Primary amines, Carbohydrates, Analytical protocols, Multiwave ultraviolet spectroscopy, Anthropogenic sources, Fish habitats, Liquid chromatography, Membrance filters, Elemental composition, Halogen organics, Batch ultrafiltraton tests, Groundwater, Streamflow conditions, Organic matter.

The study focused on developing and evaluating new analytical protocols for identifying and monitoring typical organics in surface waters, particularly in the Mississippi River. Four locations that represent drainage from pristine head waters (Bemidji), agricultural land, (Royalton), urbanized regions (St. Anthony Falls), and industrially impacted regions (Inver Grove Heights) were sampled and analyzed seasonally. Methods for measuring important functional groups and classes of compounds (carbohydrates, primary amines, organic nitrogen) have been adapted for analyzing river waters. Samples of Mississippi River water from different locations were used as indicators of pollution. A protocol was developed for using multiwave length ultraviolet spectroscopy to characterize and identify organic constituents. Computer procedures were developed to handle the large volume of handling, manipulation, and interpretation. (Mullen-IPA)
W81-04321

REMOTE SENSING OF NON-POINT SOURCE SEDIMENT IN NORTHERN MAINE,
Maine Univ. at Orono.
R. S. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-233603, Price codes: A05 in paper copy, A01 in microfiche. MS Thesis, May, 1981. 87 p, 7 Fig, 17 Tab, 24 Ref, 5 Append. OWRT-A-049-ME(3).

Descriptors: *Water quality, *Nonpoint source pollution, *Erosion, *Sedimentation, *Aroostook County, Maine, *Remote sensing, River monitoring, Flight logistics, Ground truth sampling, Densitomery, Normalization, Soil loss equation, Meduxnekeag River, D-log E curve, Suspended solids, Turbidity, Photodensitometry, Calibration curve, Bottom reflectance, Sampling, Nephelometric turbidity unit, Search disc, Surface reflection, Sediment transport.

A two-year project was undertaken to develop and test procedures for quantitative monitoring of non-point source pollution using remote sensing in Aroostook County, Maine. This area has severe agricultural erosion which affects water quality in the waterways; it also severely affects the fields in the county, which are generally used for potato farming. Field erosion exceeds the recommended maximum soil loss limits by two to three times. The purpose of the study project was to develop a remote sensing technique to locate the area of the watershed within the waterway. The use of remote sensing techniques in connection with appropriate ground sampling was studied in relationship to evaluate sediment loading caused by agricultural erosion. Laboratory and field work was performed during 1979 and 1980 to test, modify, and refine these procedures. The methodology developed needs further testing and refinement before it can be used as a routine analytical procedure for locating and quantifying non-point source pollution. (Mullen-IPA)
W81-04365

MONITORING WELL SAMPLING AND PRESERVATION TECHNIQUES,
Illinois State Water Survey, Urbana.
J. P. Gibb, R. M. Schuller, and R. A. Griffin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-175086, Price codes: A13 in paper copy, A01 in microfiche. In: Disposal of Hazardous Waste; Proceedings of the Sixth Annual Research Symposium, March 17-20, 1980, Chicago, Illinois. Environmental Protection Agency Report EPA-600/9-80-010, March, 1980. p 31-38, 5 Fig, 7 Ref.

Descriptors: *Groundwater, *Monitoring, *Wells, *Sampling, *Sample preservation, Pumping, Hydrogen ion concentration, Metals, Filters, Water level, Chemical composition, Iron.

The development of recommended sampling procedures and preservation techniques for monitoring wells is necessary to ensure standard sampling procedures and preservation techniques. Preliminary results from six study sites using four different pumping mechanisms and various sample preservation techniques are presented. For the one pumping test reported, a pumping rate of 200 ml/min should produce water samples containing a higher percentage of aquifer water in the shortest period of time. The four pumping mechanisms used were mechanical, air-lift, nitrogen-lift, and bailer. The pump mechanism and the pipe diameter affected the pH of the samples, which alters the concentrations of metals, particularly iron. The samples were filtered through 0.22, 0.45, or 3.0 micrometer membranes. The smaller filters reduced the concentration of iron considerably, and other metals slightly, compared with the 3 micrometer filter. The relative magnitude of these appears to be site specific and related to: the yield potential of the well; the depth, diameter, and water level of the well; the pumping rate; the general chemical character of the water; and the specific elements that are to be monitored. (Brambley-SRC)
W81-04487

RESISTIVITY INVESTIGATIONS FOR GROUND WATER IN METAMORPHIC AREAS NEAR DHANEAD, INDIA,
Indian School of Mines, Dhanbad. (India).
R. K. Verma, M. K. Rao, and C. V. Rao.
Ground Water, Vol 18, No 1, p 46-55, January, 1980. 9 Fig, 7 Ref.

Descriptors: *Water scarcity, *Groundwater inventory, *Sounding, Surface runoff, Percolation, Groundwater movement, Groundwater runoff, Groundwater potential, Water shortage, Arid zones, *India.

Large runoff of rain water and limited percolation into the ground combine to create a situation of water scarcity in large sections of Eastern India. Groundwater investigation have been carried out in recent years using electrical resistivity methods. The data from 78 Schlumberger soundings has yielded both A and H type curves. While studying the overall variation of resistivity values in the areas in and around Dhanbad, it was noted that the curves with arithmetic mean values were quite representative. Spectral and regression analyses yielded nearly identical values. The thickness of the weathered layer as deduced from Schlumberger soundings apparently partly includes the unweathered/fractured layer as well. While endeavoring to establish an empirical relationship between the daily water yield in gallons and the longitudinal conductance of the weathered layer, two empirical relationships were obtained--one for winter and one for the summer months. (Baker-FRC)
W81-04634

7C. Evaluation, Processing and Publication

DENVER TRAINS SEWAGE CONTROL STAFF IN COMPUTERIZED SYSTEM,
Metropolitan Denver Sewage Disposal District No 1, CO.
For primary bibliographic entry see Field 5D.
W81-04312

GROUND-WATER-QUALITY ATLAS OF WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
P. A. Kammerer, Jr.
Wisconsin Geological and Natural History Survey Madison Information Circular 39, 1981. 39 p, 13 Ref.

Descriptors: *Groundwater, *Water quality, *Hydrologic data, *Maps, Aquifers, Aquifer characteristics, Water properties, Inorganic compounds, Trace elements, Water chemistry, Bibliographies, *Wisconsin.

This report summarizes ground-water-quality data, for Wisconsin, stored in the U.S. Geological Survey's computer system (WATSTORE). The summary includes water-quality data for 2,443 wells which tap one of the State's three major aquifers (sand and gravel, Silurian dolomite, and sandstone). Data for dissolved solids, hardness, alkalinity, calcium, magnesium, sodium, potassium, iron, manganese, sulfate, chloride, fluoride, and nitrate are summarized by aquifer and by county, and locations of wells where data are available are shown for each aquifer. Calcium, magnestium, and bicarbonate (the principal component of alkalinity) are the major dissolved constituents present in Wisconsin's ground water. High iron concentrations and hardness cause ground-water-quality problems in much of the State. Statewide summaries of trace constituent (selected trace metals, arsenic, boron, and organic carbon) concentrations show that they impair water quality in only a few isolated wells. A bibliography of published reports that describe or summarize various aspects of ground-water quality in Wisconsin is included. (USGS)
W81-04322

WATER RESOURCES IN THE SEDONA AREA, YAVAPAI AND CONCONINO COUNTIES, ARIZONA,
Geological Survey, Phoenix, AR. Water Resources Div.
C. W. Levings.
Arizona Water Commission Phoenix Bulletin 11, 1980. 37 p, 6 Fig, 3 Plates, 7 Tab, 13 Ref.

Descriptors: *Groundwater availability, *Available water, *Water quality, Potential water supply, Geologic formations, Aquifers, Water level, Groundwater movement, Recharge, Surface-groundwater relations, Wells, Water yield, Hydrologic data, Well data, Drillers logs, Stream discharge, *Arizona, Sedona area, Yavapai County, Coconino County.

Groundwater is the only available source of water to support the growing population in the 300-square-mile Sedona area, Ariz. In 1974 about 730 acre-feet of groundwater was withdrawn for domestic and public supplies, and about 1,400 acre-feet per year will be needed by 1990. Most of the groundwater occurs in the regional aquifer, which locally includes the Verde Formation, Coconino Sandstone, Supai Formation, Redwall Limestone, Martin Formation, and Tapeats Sandstone. Base flow in Oak Creek--the main stream that drains the area--is maintained by springs that issue from the regional aquifer. Annual discharge from the area includes about 37,000 acre-feet of base flow in Oak Creek, 13,000 acre-feet of subsurface flow from the regional aquifer, and 8,000 acre-feet of evapotranspiration along Oak Creek. Water in the Sedona area generally is of acceptable chemical quality for public supplies, and water from most wells contains less than 500 milligrams per liter of dissolved solids. Some wells that tap the Verde Formation, however, yield water that contains as much as 891 milligrams per liter of dissolved solids, and one well that taps the Supai Formation, Redwall Limestone, and Martin Formation yields water that contains 1,480 milligrams per liter. (USGS)
W81-04328

SURFICIAL GEOLOGY OF HANNIBAL QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
T. S. Miller.
Available from the OFSS, USGS, Box 25425, Denver Fed. Ctr., Denver, CO 80225, paper copy $2.50, microfiche $0.50. Geological Survey Open-File Report 81-129 (WRI), 1981. 1 Sheet.

Descriptors: *Geology, Glacial aquifers, *Groundwater potential, Natural resources, Geohydrology, Wells, Water yield, Maps, *New York, *Oswego County, *Hannibal quadrangle.

The location and extent of 10 kinds of surficial deposits in part of Hannibal quadrangle, Oswego County, N.Y., are mapped on a 7.5-minute U.S. Geological Survey topographic map. The map was compiled to indicate the lithology and potential for ground-water development at any specific location. (USGS)
W81-04329

SURFICAL GEOLOGY OF PART OF CAMDEN WEST QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
T. S. Miller.
Available from the UFSS, USGS, Box 25425, Denver Fed. Ctr., Denver, CO 80225, paper copy $2.50, microfiche $0.50. Geological Survey Open-File Report 81-145 (WRI), 1981. 1 Sheet.

Descriptors: *Geology, *Glacial aquifers, *Groundwater potential, Natural resources, Geohydrology, Wells, Water yield, Maps, *New York, *Oswego County, *Camden west quadrangle.

The location and extent of six kinds of surficial deposits in Camden West quadrangle, Oswego County, N.Y., are mapped on a 7.5-minute U.S. Geological Survey topographic map. The map was compiled to indicate the lithology and potential for ground-water development at any specific location. (USGS)
W81-04331

LONG-TERM CHEMICAL-QUALITY CHANGES IN SELECTED DELAWARE STREAMS,
Geological Survey, Portland, OR. Water Resources Div.
S. W. McKenzie.
Delaware Geological Survey, Newark, Report on Investigations No 34, November, 1979. 41 p, 13 Fig, 13 Tab, 16 Ref, Append.

Descriptors: *Water quality, *Chemical analysis, Data collections, Sampling, Streamflow, Specific conductivity, Ions, Stream discharge, Regression analysis, Flow duration, *Delaware, Brandywine Creek, St. Jones River, Nanticoke River.

Data from three streamflow water-quality stations in Delaware were statistically analyzed to determine the relationships of the major inorganic chemical constituents to specific conductance and to stream discharge. The results show that ion concentrations varied directly with the flow and with specific conductance. A set of regression equations defining these relationships were derived for each of the three stations: Brandywine Creek at Wilmington, St. Jones River at Dover, and Nanticoke River near Bridgewille. Concentrations of major inorganic chemical constituents for the three stations and for 13 low-flow partial record sites were also compared to median ground water concentrations. Positive correlations were obtained in all cases except for the St. Jones River at Dover. Data for Brandywine Creek and the St. Jones River showed that the concentrations of major ions increased with time when analyzed at flow durations of 50 percent and 90 percent. However, the increases were not the same magnitude at the two stations and did not always vary directly with time. (USGS)
W81-04332

SURFICIAL GEOLOGY OF PANTHER LAKE QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
T. S. Miller.
Available from the OFSS, USGS, Box 25425, Denver Fed. Ctr., Denver, CO 80225, paper copy $2.50, microfiche $0.50. Geological Survey Open-File Report 81-146 (WRI), 1981. 1 Sheet.

Descriptors: *Geology, *Glacial aquifers, *Groundwater potential, Natural resources, Geohydrology, Wells, Water yield, Maps, *New York, *Oswege County, *Panther Lake quadrangle.

The location and extent of eight kinds of surficial deposits in Panther Lake quadrangle, Oswego County, N.Y., are mapped on a 7.5-minute U.S. Geological Survey topographic map. The map was compiled to indicate the lithology and potential for groundwater development at any specific location. (USGS)
W81-04334

RESULTS OF TEST DRILLING FOR GROUNDWATER IN THE SOUTHEASTERN UINTA BASIN, UTAH AND COLORADO,
Geological Survey, Salt Lake City, UT. Water Resources Div.
W. F. Holmes.
Geological Survey Water-Resources Investigations 80-951. 1980. 90 p, 15 Fig, 6 Plates, 13 Tab, 5 Ref.

Descriptors: *Groundwater, *Water quality, Aquifers, *Aquifer characteristics, Data collections, Geohydrology, Drilling, Test holes, Wells, Sampling, Chemical analysis, *Utah, *Colorado, Southeastern Uinta basin, Oil shale.

During 1974, the U.S. Geological Survey began a comprehensive hydrologic study of the oil-shale area in the southeastern Uinta Basin of Utah and Colorado. From 1976 to 1978, six deep test holes were drilled principally to obtain information about aquifers in the Green River Formation of Tertiary age. Information obtained from the drilling project includes description of lithologic samples from core and drill cuttings, temperature and geophysical logs, drilling logs, packer tests, aquifer (pumping and recovery) tests, and analyses of water samples. Logs and analyses of water samples indicate the occurrence of two major aquifers. The 'bird's-nest' aquifer was penetrated in two of the test holes and is apparently a major aquifer in the central part of the study area. This aquifer occurs about 400 feet above the Mahogany zone, an oil-shale bed in the Parachute Creek Member of the Green River Formation. A water sample collected during drilling indicated a dissolved-solids concentration of 9,870 milligrams per liter. The Douglas Creek Member of the Green River Formation is a major freshwater aquifer in most of the study area, and it was penetrated in all six test holes. Water samples collected from this aquifer generally had dissolved-solids concentrations of less than 1,000 milligrams per liter. Values of transmissivity calculated for the Douglas Creek aquifer from hydrologic tests ranged from 16 to 170 feet squared per day. Estimates of storage coefficients ranged from about 0.00025 to 0.0007. (USGS)
W81-04335

WATER RESOURCES DATA FOR CONNECTICUT, WATER YEAR 1980,
Geological Survey, Hartford, CT. Water Resources Div.
Geological Survey Water-Data Report CT-80-1, 1981. 400 p, 4 Fig.

Descriptors: *Hydrologic data, *Surface water, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Wells, Water level, Data collections, Sites, *Connecticut.

Water Resources Data for the 1980 water year for Connecticut consist of records of stage, discharge, and water quality of streams; stage, contents and water quality of lakes and reservoirs; and water levels and water quality of groundwater wells. This report contains records for water discharge at 53 gaging stations; storm discharge at 7 gaging stations; tidal volume at 1 gaging station; contents at 36 lakes and reservoirs; water quality at 46 gaging stations, 5 lakes and reservoirs, 2 harbors, 34 wells and 1 spring; and water levels at 59 observation wells. Also included are 44 crest-stage partial-record stations. Additional water data were collected at various sites not part of the systematic data-collection program and are published as miscellaneous measurements and analyses. A few pertinent stations (not included above) in bordering States are also included. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Connecticut. (USGS)
W81-04336

SURFICIAL GEOLOGY OF PART OF WESTDALE QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
T. S. Miller.
Available from the OFSS, USGS, Box 25425, Denver Fed. Ctr., Denver, CO 80225, paper copy $3.50, microfiche $0.50. Geological Survey Open-File Report 81-147 (WRI), 1981. 1 Sheet.

Descriptors: *Geology, Glacial aquifers, *Groundwater poential, Natural resources, Geohydrology, Wells, Water yield, Maps, *New York, *Oswego County, *Westdale quadrangle.

The location and extent of seven kinds of surficial deposits in part of Westdale quadrangle, Oswego County, N.Y., are mapped on a 7.5-minute U.S. Geological Survey topographic map. The map was compiled to indicate the lithology and potential for groundwater development at any specific location. (USGS)
W81-04337

SURFICIAL GEOLOGY OF WILLIAMSTOWN QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
T. S. Miller.
Available from the OFSS, USGS, Box 25425, Denver Fed. Ctr., Denver, CO 80225, paper copy $2.50, microfiche $0.50. Geological Survey Open-File Report 81-148 (WRI), 1981. 1 Sheet.

Descriptors: *Geology, Glacial aquifers, *Groundwater poential, Natural resources, Geohydrology, Wells, Water yield, Maps, *New York, Oswego County, *Williamstown quadrangle.

The location and extent of seven kinds of surficial deposits in Williamstown quadrangel, Oswego County, N.Y., are mapped on a 7.5-minute U.S. Geological Survey topographic map. The map was compiled to indicate the lithology and potential for groundwater development at any specific location. (USGS)
W81-04340

CROSS SECTIONS OF THE HUDSON RIVER ESTUARY FROM TROY TO NEW YORK CITY, NEW YORK,
Geological Survey Albany, NY. Water Resources Div.
D. A. Stedfast.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-202384, Price codes: A05 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 80-24, November, 1980. 70 p, 3 Fig, 1 Tab, 4 Ref.

Descriptors: *Bathymetry, *Cross-sections, Data collections, *Estuaries, Channels, River beds, Depth, Fathometers, Sounding, Thalweg, Profiles, Surveys, *New York, *Hudson River.

Data on channel geometry of the Hudson River estuary at 125 cross sections between the Federal Dam at Troy and the norhtern limits of New York City (133 miles) are presented for use in hydraulic modeling, tidal studies, traveltime and water-quality studies, and other uses requiring knowledge of Hudson River channel properties. The data were obtained from field surveys of the estuary conducted by boat with a fathometer in 1966-69. Water-surface elevations were not recorded during the fathometer runs but were calculated in 1979 from information on tide variations in the estuary and from stage data collected at Albany and New York City. Topographic maps and field reconaissance were used to extend the ends of the cross sections beyond 100-year flood stage. Channel-configuration data are presented as perspective plots and in a table; also included are strip maps showing the location of the cross sections. (USGS)
W81-04341

POTENTIOMETRIC MAP OF THE WINONA-TALLAHATTA AQUIFER IN NORTHWESTERN MISSISSIPPI, FALL 1979,
Geological Survey, Jackson, MS. Water Resources Div.
B. E. Wasson.
Available from the OFSS, USGS, Box 25425, Denver Fed. Ctr., Denver, CO 80225, paper copy $1.75, microfiche $0.50. Geological Survey Open-File Report 80-598 (WRI), 1980. 2 Sheet, 22 Ref.

Descriptors: *Maps, *Potentiometric level, Aquifers, *Groundwater, Natural recharge, Wells, Pumping, Water level, Hydrographs, *Mississippi, *Winona-Tallahatta aquifer, Geohydrology.

The potentiometric map of the Winona-Tallahatta aquifer is one of a series of maps, prepared by the U.S. Geological Survey in cooperation with the Mississippi Department of Natural Resources, Bureau of Land and Water Resources, delineating the potentiometric surfaces of the major aquifers in Mississippi. In the outcrop area of the Winona-Tallahatta aquifer the potentiometric surface is strongly affected by recharge from precipitation, by topography, and by drainage of the aquifer by streams. The potentiometric surface slopes downward generally to the west away from the area of outcrop and is strongly affected by recharge from precipitation, by topography, and by drainage of the aquifer by streams. The potentiometric surface slopes downward generally to the west away from the area of outcrop and is strongly affected by pumpage from wells in Leflore, Sunflower, and Bolivar Counties, Historically, water levels in or near the outcrop of the Winona-Tallahatta have shown little or no long-term changes, but the heavy withdrawals in the confined part of the aquifer have caused long-term water-level declines of 1 to 2 feet per year. (USGS)
W81-04342

POTENTIOMETRIC MAP OF THE LOWER WILCOX AQUIFER IN MISSISSIPPI, FALL 1979,
Geological Survey, Jackson, MS. Water Resources Div.
B. E. Wasson.
Available from the OFSS, USGS, Box 25425, Denver Fed. Ctr., Denver, CO 80225, paper copy $1.75, microfiche $0.50. Geological Survey Open-File Report 80-597 (WRI), 1980. 1 Sheet, 19 Ref.

Descriptors: *Maps, *Potentiometric level, *Aquifers, Groundwater, Natural recharge, Wells, Pumping, Water level fluctuations, Hydrographs, Groundwater hydrology, *Mississippi, *Lower Wilcox aquifer.

The potentiometric map of the lower Wilcox aquifer is one of a series of maps, prepared by the U.S. Geological Survey in cooperation with the Mississippi Department of Natural Resources, delineating the potentiometric surfaces of the major aquifers in Mississippi. In the outcrop area of the lower Wilcox aquifer the potentiometric surface is strongly affected by recharge from precipitation, by topography, and by drainage of the aquifer by streams. The potentiometric surface slopes downward generally to the west away from the area of outcrop but is strongly affected by pumpage from public and industrial wells in several areas in northwestern Mississippi. This pumpage has caused a large shallow depression in the potentiometric surface in the Marks-Batesville-Charleston-Tunica area. (USGS)
W81-04344

POTENTIOMETRIC MAP OF THE MERIDIAN-UPPER WILCOX AQUIFER IN MISSISSIPPI, FALL 1979,
Geological Survey, Jackson, MS. Water Resources Div.
B. E. Wasson.
Available from the OFSS, USGS, Box 25425, Denver Fed. Ctr. Denver, CO 80225, paper copy $1.75, microfiche $0.50. Geological Survey Open-File Report 80-590 (WRI), 1980. 1 Sheet, 21 Ref.

Descriptors: *Maps, *Potentiometric level, *Aquifers, Groundwater, Natural recharge, Wells, Water level, Hydrographs, *Mississippi, *Meridian-upper Wilcox aquifer, Geohydrology.

The potentiometric map of the Meridian-upper Wilcox aquifer is one of a series of maps, prepared by the U.S. Geological Survey in cooperation with the Mississippi Department of Natural Resources, Bureau of Land and Water Resources, delineating the potentiometric surfaces of the major aquifers in Mississippi. In the outcrop area of the Meridian-upper Wilcox aquifer the potentiometric surface is strongly affected by recharge from precipitation, by topography, and by drainage of the aquifer by streams. The potentiometric surface slopes downward generally to the west away from the area of outcrop and is strongly affected by large groundwater withdrawals in the Greenwood, Indianola, Marks, Grenada, and Memphis areas. Historically, water levels in or near the outcrop of the Meridian-upper Wilcox have shown little or no long-term changes, but during the past 20 years water levels have declined from 1 to 2 feet per year in much of the confined part of the aquifer. (USGS)
W81-04346

EROSION AND SEDIMENTATION DATA CATALOG OF THE PACIFIC NORTHWEST,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
For primary bibliographic entry see Field 2J.
W81-04372

8. ENGINEERING WORKS

8A. Structures

FLOOD EMERGENCY PLANS; GUIDELINES FOR CORPS DAMS,
H. J. Owen.
Army Corps of Engineers, Hydrologic Engineering Center, Davis, Califonia, Report, June, 1980. 65 p, 6 Fig, 2 Tab, 6 Ref, 1 Append. DACW05-79-P-1962.

Descriptors: *Floods, *Dam failure, *Safety, Planning, *Design floods, Dam stability, Maps, Standards, Flooding, Spillway capacity, *Design criteria.

Recent emphasis on dam safety and flood emergency evacuation plans has resulted in new requirements for Federal dam safety, including the preparation of emergency plans for all Corps of Engineers dams. Much of the land constituting the area that would be inundated by spillway design flows is not in Federal ownership. The possibility therefore exists at many dams that large flows could cause a hazard to life and property in reservoir areas. In addition, flows from reservoirs during design floods could be hazardous to life and property in downstream areas. The principal components of dam emergency plans are: emergency identification subplan; emergency operations and repair subplan; notification subplan; and evacuation subplan. Development of an emergency plan requires identification of the types of emergencies to be encompassed, accumulation of needed data and information, performance of various analyses, conceptualization of solutions, design of measures and subplans, preparation of appropriate documents and implementation of the plan. Because emergency plans are expected to be used only on rare occasions, particular care must be taken to ensure that personnel are familiar with the plan, and equipment is operable. Emergency plans are to be prepared for three conditions, including spillway design discharge without dam failure, spillway design discharge with dam failure, and dam failure at normal high pool level. An appendix provides instructions for preparation and publication of inundation maps required as a part of flood emergency plans. (Moore-SRC)
W81-04368

GRAND COULEE PUMPING-GENERATING PLANT MODEL STUDIES, CONDUIT ENTRANCES P/G7 AND P/G8,
Water and Power Resources Service, Denver, CO. Engineering and Research Center.
D. Colgate.
Report GR-80-4, December, 1980. 80 p, 56 Fig, 1 Tab.

Descriptors: *Penstocks, *Hydraulic models, *Pump turbines, *Hydraulic design, *Conduits, Pumped storage, Model studies, Canals, Hydroelectric plants, Equalizing reservoirs, Design criteria, Grand Coulee Dam, Washington.

Hydraulic model studies were performed to develop modifications of pump penstock exits at Grand Coulee Dam, Washington, for use as inlets when the penstocks supply water for new pump turbines. By installing pump-turbines rather than single-duty pumps, Banks Lake can be used as the upper reservoir in a pumped storage scheme, as well as an equalizing reservoir for irrigation. Conduits P/G7 through P/G12, in a pump discharge outlet structure of 12, were studied in a model to determine the extent of the modifications required in the pumping-generating plant siphon elbows and otulets leading to the Feeder Canal. For turbine flow, the roof of the conduit entrance should be streamlined by shaping and lowering the roof between the entrance and the circular conduit. Trashrack slots should be provided for entrances P/G7 through P/G12. A curved vortex-suppressing large-radius center wingwall should be installed upstream from, but attached to, the underdrain well. Each siphon elbow operates satisfactorily as built with a turbine discharge of 2,300 cu f/s, and at a Feeder Canal water surface elevation 1562 or higher at the canal headwall. The present Feeder Canal, with Banks Lake at or above elevation 1564.2, will convey water satisfactorily for two turbines. The present Feeder Canal does not have adequate capacity for simultaneous operation of six turbines. (Moore-SRC)
W81-04370

PERFORMANCE OF FINNED CHANNEL SEPARATOR,
Hokkaido Univ., Sapporo (Japan). Dept. of Sanitary Engineering.
N. Tambo, K. Hashimoto, M. Sugahara, T. Hasegawa, and T. Onitsuka.
Water Science and Technology, Vol 13, No 1, p Tor 409-420, 1981.

Descriptors: *Flocculation, *Separation techniques, Waste water treatment, Sedimentation, *Sedimentaton basins, *Settling tanks, Settling basins, Flow, Channels, Design criteria.

The use of finned channels to the floc separation process was tried using parallel fins set on slant boards in the upright position to the rectangular direction of main channel flow and admitting flocs into vortex streams created behind the fins. The use of dynamic separation other than gravitational was expected to accelerate the separation. A mathematical model of the separation process is presented. In Japan at the present time more than 50 finned channel separators are working. Performance data on the finned channel separator of Hakodate City is presented. (Baker-FEC)
W81-04412

A CLOSER LOOK AT EXISTING SPILLWAY CAPACITY AND DOWNSTREAM FLOOD HAZARDS,
Burgess and Niple, Ltd., Columbus, OH.
D. M. Hill.
Public Works, Vol 112, No 3, p 64-66, March, 1981. 3 Fig.

Descriptors: *Dams, *Spillway capacity, *Design floods, Floods, Spillways, Flood control, Legal aspects.

Phase 1 inspections, which assess the structural and operational adequacy of dams, have identified many dams that are unsafe because of inadequate spillway capacity. An existing spillway unable to convey the spillway design flood set by the Corps of Engineers may result in overtopping of the dam, causing dam failure. This hazard classification may be judgmental. Investigations often do not include in-depth analysis of downstream effects. Assessment of these threats could be the basis for struc-

tural or geotechnical design criteria. Case studies are presented which describe a variety of Phase 1 reports and flood hazards. Phase 1 investigations are limited in scope, since they only identify potentially hazardous dams. Flood hazard analyses performed as part of Phase 2 studies can better define the real threat associated with overtopping failure. Thus, because of the downstream situation, an inadequate spillway may actually be adequate for the situation. (Small-FRC)
W81-04466

METHOD AND A DEVICE FOR AUTOMATIC CLEANING OF TRASHRACKS AT WATER INTAKES FOR WATER POWER PLANTS AND SIMILAR,
H. Hansson.
U.S. Patent No 4,218,319, 6 p, 4 Fig, 6 Ref; Official Gazette of the United States Patent Office, Vol 997, No 3, p 9920993, August 19, 1980.

Descriptors: *Patents, *Water quality control, Industrial water, Intakes, Trash racks, Cleaning, Engineering structures.

The invention provides a device for automatic cleaning of trashracks. The device comprises a rake arm upheld by a support which is movable sideways in parallel with the trashrack. A wedge-shaped rake is pivotally mounted at the lower end of the rake arm, which by drive means is moved downwards and upwards along the trashrack, the rake thereby engaging the trashrack. During its downward movement the rake shoves away the trash gathered at the trashrack, whereupon a part of it can pass in between the bars of the trashrack and a part is again gathered in from the trashrack. This part of the trash which does not pass the trashrack is brought with the rake during its upward movement and is delivered in a chute or similar in the usual way. The amount of trash that has to be lifted by the raking device is considerably reduced. (Sinha-OEIS)
W81-04519

SEALING SEWERE IN UNSTABLE SOILS,
American City and County, Vol 96, No 3, p 48-49, March, 1981.

Descriptors: *Sewer systems, *Sealants, Soil stability, Seawater, Elastomers, Florida, Hollywood, Leakage, *Influent seepage, Economic aspects.

The sanitary sewer system in Hollywood, Florida, is largely below sea level, resulting in almost constant movement of the pipes. The sanitary system suffers from significant saltwater infiltration, which causes serious corrosion problems at the sewage treatment plant. The contractor hired to rehabilitate the sewer system to control infiltration convinced city officials to try sealing the sewer joints using a new 3M product, CR-250 Sealing Gel. The gel, an elastomer compound, sets to form a new, rubbery gasket in the leaking pipe joint and forms a collar around the outside of the pipe joint. The gel promised to be effective in the muck and saltwater around the sewer pipes and to bend and shift with pipe movement. Using the gel to seal just one 6.6 mile section of 8-inch vitrified clay pipe is estimated to have resulted in the reduction of the treatment plant's load by 3 million gallons per day. After 11 months in service, the sealed joints and cracks showed no loss of pressure during pressure tests. The sealing gel was also used to repair brick and mortar manholes which showed high infiltration. Experimental use of the gel to repair longitudinal cracks in the pipes has also proved successful. The cost of the sealing project was about half of the estimated cost of sewer excavation and replacement. (Carroll-FRC)
W81-04544

HOW LONG CAN METAL CULVERTS LAST.
American City and County, Vol 95, No 9, p 51-53, September, 1980. 1 Tab.

Descriptors: *Culverts, *Corrosion, Deterioration, Resistivity, Metal pipes, Louisiana, Michigan.

Research was undertaken to predict culvert working life and to determine what measures could prolong culvert life. Coated and uncoated galvanized steel and coated and uncoated aluminum alloy culverts, both 16 gauge, were studied in Louisiana. After six years of exposure, galvanized steel was still in good condition. In acid soil, corrosion proceeded at a slow steady pace, and in a low resistivity environment, corrosion proceeded rapidly. A Michigan study noted that corrosion took place inside the culvert to a moderate degree, but in most cases, major deterioration was occurring on the outside. The Michigan study also noted that the first four to six feet of the pipe tended to deteriorate faster. The aluminum culverts were found in the Louisiana study to be in good to fair condition after six years. Pitting was extreme at low-resistivity, brackish water sites. The Michigan study, which examined more culverts than the Louisiana study, did not find that corrosion always occurred in low-resistivity environments. (Small-FRC)
W81-04546

ICOLD'S XIII CONGRESS.
International Water Power and Dam Construction, Vol 32, No 1, p 31-37, January, 1980. 4 Fig.

Descriptors: *Dam failure, *Dam construction, *Spillways, Conferences, *Dam design, Case studies.

Three questions considered at the thirteenth ICOLD conference are discussed: interface problems of dams, deterioration or failure of dams, and large capacity outlets and spillways. Interface problems can be avoided when designers plan for possible two-stage construction when originally building a dam. The use of fabric filters in dam construction was suggested as a cost saving technique. The deterioration or failure of dams raised the most interest. It was suggested that ICOLD start an international center for collecting data relating to dam safety. Remedial work at Wolf Creek dam was described, and some aspects of the aging of bituminous concrete were discussed. The Teton dam failure was discussed. Large capacity outlets and spillways generated 148 written or spoken contributions. These included contributions on Cabora Bassa spillway operation, problems at Ramganga dam, and a report on the disadvantages of high-head gated conduits. Cavitation erosion and runner vibration were the subjects of many discussions. (Small-FRC)
W81-04597

ICOLD'S XIII CONGRESS, PART TWO.
International Water Power and Dam Construction, Vol 32, No 2, p 53-54, February, 1980.

Descriptors: *Seismic waves, *Dam failure, *Dam effects, Earthquakes, Foundation failure, Case studies, Reservoirs, Conferences.

Discussions at the thirteenth ICOLD conference are summarized regarding seismicity and a seismic design of dams. The effects of various size earthquakes were discussed, and dam failures were detailed. For example, during the Tangshan earthquake of 1976, the Miyun reservoir dam (People's Republic of China) failed because of liquefaction of sand and gravel. Various analysis procedures were proposed for designing dams to be resistant to earthquake damage. The problem of induced seismicity was debated. At the Koyna dam in India, many observers felt that the shock was induced, based on the unlikely coincidence of tremor phenomena starting simultaneously with lake filling. However, deep seismic sounding surveys carried out ten years after the shock revealed a major fault west of Koyna. No correlation between reservoir depth and volume and seismicity has been established. Case histories of known field performance of dams under conditions of strong shaking must be collected and analyzed. (Small-FRC)
W81-04598

PIPE - AN IN DEPTH LOOK,
T. Davey, and T. Bhagat.
Water and Pollution Control, Vol 118, No 2, p 8-10, February, 1980. 1 Fig.

Descriptors: *Pipes, Water transport, Pipelines, *Water mains, Conveyance structures, Aqueducts, Plumbing, *Sewer systems, Design criteria, Materials engineering.

This review discusses the current state-of-the-art for water main and sewerage distribution systems. Technical material on specific types of pipes has been supplied by industry. The two basic categories of pipe are rigid and flexible. The choice of a specific pipe is dependent on several factors. Steel pipe is suitable for some purposes, ductile iron pipe for others. The asbestos cement pipe is a rigid pipe which remains popular especially in Western Canada. A-C pipe is not adversely affected by the freezing temperatures. Polyvinyl chloride and polyethylene materials are now opening new perspectives in the pipe field. A dense corrugated polyethylene pipe has been recently introduced into North American markets for gravitational drainage, with good possibilities for the future. (Baker-FRC)
W81-04612

MODERN IRON PIPE,
E. Kiilaspea.
Water and Pollution Control, Vol 118, No 2, p 9, February, 1980.

Descriptors: *Pipes, Water transport, Pipelines, Water mains, *Materials engineering, Design criteria.

The major waterworks material, used mainly today as ductile iron pipe, is the cast iron pipe. Until recently a large choice of piping materials did not exist. With recent developments cast iron pipe has been upgraded to ductile iron, giving it all the properties of mild steel. Beam breaks due to frost and ground settlement lodings have almost been eliminated. The only failure that may occur in ductile iron is a pinhole type of penetration due to corrosion. All iron pipe is now being cement-lined to prevent internal corrosion and tuberculation, thus maintaining the flow characteristics of new pipe. (Baker-FRC)
W81-04615

THE EUPHRATES DAM PROJECT IN SYRIA,
N. Samman.
Industrial Water Engineering, Vol 17, No 4, p 23-25, July/August, 1980. 4 Tab, 7 Ref.

Descriptors: *Earth dams, *Hydroelectric power, *Irrigation engineering, Irrigation efficiency, Mathematical models, Resources management, Watershed management, *Syria, Euphrates Dam, *Multipurpose reservoirs.

The Euphrates Dam was constructed in Syria in 1975 to increase the agricultural potential of the river basin. It is an earthfill dam with an impervious clay core that is 4500 meters long and 60 meters high. The artificial lake, Lake Assad, covers an area of 63,000 hectares, among which at present some 28,000 hectares are already irrigated and 7000 hectares use only rainfall. Three power generators are installed, each with a capacity of 100 megawatts. Since the dam is a multipurpose project, a computer model was developed to quantify the relationships between the variables pertaining to irrigation uses and power uses. The economic return for each unit of water released for hydroelectric power and irrigation can be calculated for each month. Thus, economic returns can be maximized. The percentage of water diverted from the area for irrigation that returns to the river is about 30%. (Small-FRC)
W81-04633

8B. Hydraulics

PREVENTION OF VORTICES AT PUMP INTAKES,
H. Y. Rajagopal.
Power Engineering, Vol 85, No 1, p 52-53, January, 1981. 8 Fig, 4 Ref.

Descriptors: *Vortices, *Hydraulic design, *Pumps, Velocity, Pump testing, Viscosity, Physi-

cal properties, Flow, Sumps, Submergence, Eddies, Temperature, Hydraulics, Froude number, Reynolds number, Weber number.

Problems caused by vortices at pump intakes and rules for hydraulic design are discussed. Vortices can cause reduced pump efficiency, vibration and noise, wear of bearings, and deterioration of impeller blades. Conditions that are favorable to vortex development are large velocity in the intake pipe, low depth of submergence of the intake or suction bell, and presence of low momentum fluid or dead zones in combination with channel geometry. Efforts to develop design rules are based on experience and include published standards. However, when it is necessary to depart from standards to accommodate constraints of cost, site, or structure, model studies are recommended. Mixed and axial flow pumps at speeds greater than 5000 rpm are susceptible to vortex problems and should have model studies done. For a model to correctly represent the flow conditions of its prototype, it must be operated under approximately similar conditions, maintaining the same Froude number and a minimum Reynolds number. (Titus-FRC)
W81-04453

8C. Hydraulic Machinery

PRESSURE SEWER SYSTEM PROVES EFFECTIVE, ECONOMICAL,
Douglas County, OR.
W. C. Bowne, and H. L. Ball.
Public Works, Vol 112, No 3, p 83-86, March, 1981. 2 Fig, 3 Tab, 4 Ref.

Descriptors: *Pressure conduits, *Sewer systems, *Performance evaluation, Costs, Pumps, Activated sludge, Filtration, Oregon.

A pressure sewer system can provide an alternative to conventional sewerage in areas with hilly terrain, high groundwater, shallow bedrock, or other problems. In Glide, Oregon, development was sparse enough so that long lengths of sewer pipe would be needed between homes, but dense enough so that failing drainage fields were a concern. Glude's pressure sewer system was developed; it serves 2000 people and involves 20 miles of main and 400 tank and pump assemblies. It uses septic tank effluent pumps (STEP). As an alternative system recognized by the Environmental Protection Agency, pressure sewers qualify for 85% federal funding. Most pressure sewer systems have experienced substantial cost savings. A system constructed in Idaho in 1974 cost $500,000, as opposed to an estimated $6 million for conventional sewers. At Glide, there is a 1000 gal interceptor tank which removes grit, grease, and stringly material. Treatment is provided by an oxidation ditch (activated sludge), followed by multimedia filtration. The absence of infiltration and inflow is a definite benefit. (Small-FRC)
W81-04469

PUMP RESEARCH, DEVELOPMENT AND TESTING,
Effluent and Water Treatment Journal, Vol 20, No 9, p 442-443, September, 1980. 2 Fig.

Descriptors: *Pump testing, *Pumps, *Research facilities, Test facilities, Hydraulic equipment.

A pump research and development laboratory operated by Weir Pumps Limited at its Alloa (Britain) facility is fully equipped and is valued at one million pounds sterling. In the spacious main bay, experimental rigs absorbing power up to 2000 KVA can be run. At present, a canister pump is being studied. In these pumps, the vertical shaft pump is suspended inside its own sealed suction well, which can be installed with the impeller at a suitable depth below the floor and with the minimum water level above the floor. Impeller types, suction design, speed, casing type, axial and radial thrust, canister length, diameter, branch position, and flow conditions are assessed. The efficiency and suction performance of bowl pumps are also being studied. Model testing and production testing are performed. A new large-flow production bed has been built; it cost 500,000 pounds sterling. It can carry out full production tests under operating conditions for pumps absorbing up to 15,000 kW of power, with flows from 8000 to 65,000 cu m/hr. (Small-FRC)
W81-04574

8D. Soil Mechanics

EFFECT OF ORGANIC CHEMICALS ON CLAY LINER PERMEABILITY; A REVIEW OF THE LITERATURE,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
K. W. Brown, and D. Anderson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-175086, Price codes: A13 in paper copy, A01 in microfiche. In: Disposal of Hazardous Waste; Proceedings of the Sixth Annual Research Symposium, March 17-20, 1980, Chicago, Illinois. Environmental Protection Agency Report EPA-600/9-80-010, March, 1980. p 123-134, 1 Fig, 3 Tab, 55 Ref.

Descriptors: *Clay minerals, *Linings, *Permeability, *Organic compounds, *Literature review, Liquid wastes, Basins, Illite, Kaolinite, Montmorillonite, Soil adsorption capacity, Wettability, Soil structure.

A list of organic chemicals found in waste impoundments and a list of clay minerals used to line impoundments were developed, and possible mechanisms for the failure of the liners were reviewed. Organic chemicals may be classified as acids, bases, neutral-polar, and neutral-nonpolar. The clay minerals most often used for lining impoundments are kaolinite, illite, and montmorillonite. Failure mechanisms include clay dissolution, volume changes, and soil piping. Clay dissolution can result from the action of bases and acids, with montmorillonite being most susceptible to the action of acids. Because montmorillonite has the greatest capacity to adsorb water it is most susceptible to volume changes caused by extraction and displacement of interlayer water, and changes in wettability. Soil piping is associated with vertical contrasts of the structure and permeability in soils and with changes in pore size. Kaolinite and illite appear to be more susceptible to soil piping than montmorillonite. (Brambley-SRC)
W81-04494

ASSESSMENT OF LINER INSTALLATION PROCEDURES,
Southwest Research Inst., San Antonio, TX.
For primary bibliographic entry see Field 8G.
W81-04495

8G. Materials

ASSESSMENT OF LINER INSTALLATION PROCEDURES,
Southwest Research Inst., San Antonio, TX.
D. W. Shultz, and M. P. Miklas, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-175086, Price codes: A13 in paper copy, A01 in microfiche. In: Disposal of Hazardous Waste; Proceedings of the Sixth Annual Research Symposium, March 17-20, 1980, Chicago, Illinois. Environmental Protection Agency Report EPA-600/9-80-010, March, 1980. p 135-159, 74 Fig, 3 Ref.

Descriptors: *Linings, *Landfills, *Reservoirs, *Waste water lagoons, *Clays, *Soil sealants, *Polymers, Soil compaction, Sterilization, Installation, Subsoil, Impervious membranes.

A study is being conducted to identify current methods and equipment used to prepare supporting subgrade and place liners at various impoundments in the United States. Subgrade preparation and liner placement activities have been observed at fifteen sites to date. The sites selected have included landfills, waste water impoundments, and potable water reservoirs, and the liners have included compacted clays, soil sealants and polymeric membranes. The most important aspects of subgrade preparation are compaction to produce a smooth surface, and soil sterilization to kill all plants which can grow through the liner. When polymeric membranes are installed the important aspects include: protective storage before use; securing the liner to the subgrade; seaming the liner strips together; sealing around penetrations; prevention of wind damage and ultraviolet radiation damage; and quality control of the work. When a clay such as bentonite is used, it is essential to obtain thorough and even mixing of the clay with the subgrade. Special design considerations include: plans for future expansion of the site; liner selection based on use; monitoring; surface covers; gas venting; control of surface runoff; dual liners; and special subgrades. (Brambley-SRC)
W81-04495

INTERACTION OF SELECTED LINING MATERIALS WITH VARIOUS HAZARDOUS WASTES - II,
Matrecon, Inc., Oakland, CA.
H. E. Haxo, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-175086, Price codes: A13 in paper copy, A01 in microfiche. In: Disposal of Hazardous Waste; Proceedings of the Sixth Annual Research Symposium, March 17-20, 1980, Chicago, Illinois. Environmental Protection Agency Report EPA-600/9-80-010, March, 1980. p 160-180, 1 Fig 15 Tab, 3 Ref.

Descriptors: *Linings, *Hazardous materials, *Industrial wastes, *Waste water lagoons, Testing procedures, Degradation, Deterioration, Polymers, Impervious membranes, Permeability.

Selected lining materials have been exposed to typical hazardous wastes for up to three years. These exposure tests include: one-sided exposure of a square foot of each of 12 lining materials under one foot of six different wastes; immersion testing of 12 types of polymeric membrane lining materials in water and in nine wastes; tests of nine different thermoplastic materials fabricated into bags and filled with wastes to assess their compatibility and the permeability of the membranes; outdoor exposure testing of specimens of membrane materials exposed on racks and in 12 tubs containing various wastes. No single lining material now available is suitable for the long-term impoundment of all wastes. Compatibility studies are necessary before selecting a membrane for a waste site, and only the specified waste should be impounded. The most useful tests and properties for assessing waste-liner compatibility are: membrane swelling, loss of elongation of polymeric membranes, a bag test to measure the permeability of the liner to the waste constituents. (Brambley-SRC)
W81-04496

HOW LONG CAN METAL CULVERTS LAST.
For primary bibliographic entry see Field 8A.
W81-04546

EXPERIMENTAL DETERMINATION OF THERMOPLASTIC CASING COLLAPSE PRESSURES,
Auburn Univ., AL. Dept. of Civil Engineering.
R. C. Johnson, Jr., C. E. Kurt, and G. F. Dunham.
Ground Water, Vol 18, No 4, p 346-350, July/August, 1980. 4 Fig, 3 Tab, 9 Ref.

Descriptors: *Materials testing, *Polymers, *Well casings, Casings, Temperature, Polyvinyl chloride, Acrylonitrile-butadiene-styrene, Collapse, Mechanical failure.

Polyvinyl chloride and acrylonitrile-butadiene-styrene well casings were subjected to high pressures and high temperatures to determine casing collapse resistance. The collapse resistance was inversely proportional to a function of the outside diameter-to-wall thickness ratio. For each degree Fahrenheit increase in temperature over room temperature, collapse pressure decreased 0.3 to 0.6 psi for polyvinyl chloride and 0.2 to 0.5 psi for acrylonitrile-butadiene-styrene polymer. (Cassar-FRC)
W81-04585

Field 8—ENGINEERING WORKS

Group 8G—Materials

PIPE - AN IN DEPTH LOOK,
For primary bibliographic entry see Field 8A.
W81-04612

MODERN IRON PIPE,
For primary bibliographic entry see Field 8A.
W81-04615

9. MANPOWER, GRANTS AND FACILITIES

9C. Research Facilities

THE CONSTRUCTION GRANTS PROGRAM: GETTING IT ALL TOGETHER FOR THE '89S,
Environmental Protection Agency, Washington, DC.
H. L. Longest, II.
Water and Sewage Works, Vol 127, No 3, p 36, 52, March, 1980.

Descriptors: *Grants, *Construction, Government supports, Public utility districts, Waste water treatment.

In the Environmental Protection Agency's plan for the 1980's, the biggest priority is to bring the major publicly owned waste water treatment systems (POTWs) up to the level of secondary treatment. At present, 73 of the 106 standard metropolitan statistical areas cannot provide secondary treatment for all their flows. The remaining 33 could, but do not consistently provide secondary treatment due to overloading or operation-maintenance problems. Other immediate priorities are innovative and alternative technology and help for small and rural communities. Turning the program over to the states, thus providing local responsibility for operation and maintenance, is also high on the priority list. A prime need is for stability of funding, which will allow orderly planning, prevent program starts and stops, and assure states of money needed to finish projects once they are started. (Baker-FRC)
W81-04588

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